Effective Tracking of Nationally Determined Contributions

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Abstract

Under the Paris Agreement, all Parties are required to track and report progress toward the implementation and achievement of their nationally determined contributions (NDCs). This is an international obligation, so this thesis focuses on how NDC tracking can be useful from a domestic standpoint too. Accordingly, the central research question is: "how can tracking progress toward mitigation targets in NDCs be most effective?"

The research question is investigated and answered through a case study on South Africa as one key method. Part of the case study develops a framework for effective NDC tracking—in essence, a structure for ensuring that NDC tracking is performance-oriented and supports the achievement of set objectives. The framework shows that NDC tracking is effective when it begins with planning (i.e. identifying the vision and objectives of NDC tracking), before establishing a means for achieving that vision through a logical framework approach—all set within the context of an enabling environment. There is regular feedback to support continual learning and improvement. NDC tracking is also effective when it furthers national priorities, improves policy performance, enhances understanding and transparency, promotes trust and accountability, and links climate action with socio-economic outcomes.

The framework is applied to NDC tracking in South Africa, helping to illustrate the answer to the overall research question of the thesis by asking: "how effective is NDC tracking in South Africa?" Content analysis of key documents and in-depth interviews with key stakeholders reveal that South Africa is well-equipped for NDC tracking in certain areas but can improve in others. The thesis concludes with recommendations based on the analysis. Additionally, the application of the framework to six other developing countries through comparative analysis reveals that the NDC tracking framework is broadly applicable and not country specific.

The framework developed in this thesis complements the international NDC tracking rules agreed to in 2018, by providing a possible approach for designing effective NDC tracking processes or evaluating the extent to which countries are prepared for NDC tracking and identifying areas for enhancement. While the framework is constrained to NDC mitigation tracking, it could be feasibly extended in future to encompass NDC adaptation tracking, or an even broader application for tracking all domestic climate change action.

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List of Abbreviations

AFOLU	Agriculture, Forestry, and Other Land Use
BASIC	Brazil, South Africa, India, and China
BTR	Biennial transparency report
BUR	Biennial update report (by developing countries)
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
COP	Conference of the Parties (to the United Nations Framework Convention on Climate Change)
CTF	Common tabular format
DEA	South Africa's Department of Environmental Affairs (prior to June 2019)
DEFF	South Africa's Department of Environmental Affairs, Forestry and Fisheries (after June 2019)
DMR	South Africa's Department of Mineral Resources
DoE	South Africa's Department of Energy
FMCP	Facilitative multilateral consideration of progress
GHG	Greenhous gas
ICA	International consultation and analysis
ITMO	Internationally transferred mitigation outcome
M&E	Monitoring and evaluation
MPG	Modalities, procedures, and guidelines (of the enhanced transparency framework of the Paris Agreement)
MRV	Measurement, reporting and verification
MoU	Memorandum of Understanding
NDC	Nationally determined contribution
PSEE	Private Sector Energy Efficiency Programme
REIPPP	Renewable Energy Independent Power Procurement Programme
SBSTA	Subsidiary Body for Scientific and Technological Advice
TER	Technical expert review
UNFCCC	United Nations Framework Convention on Climate Change

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1. Introduction

In 2015, the Paris Agreement established new goals for addressing climate change, aiming to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C (UNFCCC 2015, Article 2.1). To meet this goal, countries will aim to peak global greenhouse gas (GHG) emissions as soon as possible and undertake rapid reductions thereafter to achieve net-zero GHG emissions in the second half of this century. This is to be done on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty (UNFCCC 2015, Article 4.1).

In the context of the long-term goal of mitigation in the Paris Agreement, all countries are required to communicate nationally determined contributions (NDCs) (UNFCCC 2015, Article 4.2). The term "nationally determined" means that countries define their own targets and actions for and reducing GHG emissions—up to 2025 or 2030. The development of NDCs is a bottom-up process where countries decide on their own levels of ambition for addressing climate change, in light of their national circumstances, priorities, and capacities. NDCs can also contain information relating to adaptation and support (UNFCCC 2015, Article 7.11).

While countries' first NDCs, mostly communicated in 2015, show a substantial effort toward limiting global warming, these commitments are collectively insufficient to meet the Paris Agreement's temperature goal (UNFCCC 2016; UNEP 2019; Höhne et al. 2020). Should all "unconditional" commitments be fully implemented (i.e. commitments that do not hinge on international support), global average temperatures are projected to increase by 3.2°C by the end of the century (UNEP 2019). To help close this "emissions gap," countries are expected to prepare successive and progressively more ambitious NDCs over time (UNFCCC 2015; Article 4.3).

Tracking progress toward the implementation and achievement of the mitigation targets in NDCs is essential. From an international perspective, it helps to establish a clear understanding of the progress toward global emissions and temperature goals. Tracking progress toward the mitigation targets in NDCs also helps to build trust among countries, showing that these goals are achievable, and that all Parties are committed to this effort. From a domestic standpoint, tracking progress toward NDCs is equally important. The tracking process can provide a robust evidence base, which helps to promote accountability, inform policy direction, and enhance performance.

Article 13.7(b) of the Paris Agreement requires that all countries "regularly provide…information necessary to track progress made in implementing and achieving [their] NDCs…" (UNFCCC 2015). The international rules that define how countries track and report progress toward their NDCs were agreed at the 24th Conference of Parties (COP) in 2018 (UNFCCC 2018). These rules provide both obligations and flexibility for countries. The general tenor of the rules is "shall, as appropriate" (Harald Winkler, comments to author on thesis, 20 February 2019), meaning that all countries are required to comply with the rules. But countries still have options. They choose when they start reporting (but by the end of 2024 at the latest), which indicators they use to track progress toward their NDCs, and how much information to include in their reports to the United Nations Framework Convention on Climate Change (UNFCCC).

The flexibility within these international rules—and the numerous choices that are available to countries—means that it is important to investigate how NDC tracking and reporting can be most effective from a domestic standpoint, while also meeting international obligations. Accordingly, the central research question of this thesis explores: "how can tracking progress toward the mitigation targets in NDCs be most effective?"

The research question is investigated and answered through a case study on South Africa as one key method. Part of the case study involves the development of a framework for effective NDC tracking. The framework provides a structure for ensuring that NDC tracking is performance-oriented and supports the achievement of set objectives. In-depth interviews with four major sets of stakeholders (government, business, academia, and civil society) inform the design of the framework and the testing of its application. Recognizing that there are many users of mitigation monitoring information,[1] each with different objectives, this framework is designed to meet the needs and objectives of the primary users (and developers) of information for NDC tracking—typically a national government's environmental department. In the case of South Africa, this is the Monitoring and Evaluation Unit within the Department of Environment, Forestry and Fisheries (DEFF).

Finally, while appreciating that adaptation and support are essential to the global response to climate change—and, in fact, many developing countries have opted to lead their NDCs by describing adaptation measures and support needs, including South Africa—the NDC tracking framework developed in this thesis is constrained to mitigation only. This is to keep the scope of the thesis manageable, with a narrower analytical focus. Focusing on mitigation also aligns with a precise interpretation of the Article 13.7(b) of the Paris Agreement, which implies that the scope of NDC tracking is mandatory for mitigation only (Winkler et al. 2017).[2] Indeed, the international rules that define how countries track and report progress toward their NDCs deal with mitigation only (UNFCCC 2018, para. 65-79).

The thesis is structured as follows: Chapter 2 provides the context for tracking goal progress and situates the research question within the literature. Chapter 3 presents the methodology. Chapter 4 develops a framework for effective NDC tracking, and Chapter 5 applies the framework to South Africa. Based on these results, Chapter 6 identifies opportunities to enhance domestic arrangements for NDC tracking in South Africa. Chapter 7 applies the framework to six other developing countries to evaluate their NDC tracking preparedness, while also confirming the framework's applicability. Chapter 8 concludes by summarising the overall research conducted in this thesis.

[1] Users of mitigation monitoring information include national governments, sub-national governments, cities, companies, civil society, research organizations, academia, development agencies, and financial institutions.
[2] Other parts of Article 13 referring to NDCs are not specified as clearly, and capable of the broader interpretation of NDCs (Winkler et al. 2017).

2. Literature Review

The aim of this chapter is to review what is known about effective mitigation target tracking and gaps in current knowledge, especially relating to NDCs, which are a fairly new concept since the Paris Agreement only dates to 2015 and there is limited peer-reviewed literature.

This chapter examines the definitions and theory behind monitoring and evaluation (section 2.1), the history and evolution of mitigation target tracking under the UNFCCC (section 2.2), what constitutes "effective" tracking (section 2.3), and, finally, how these ideas can be applied in the context of tracking progress toward NDCs (section 2.4).

2.1. Monitoring and Evaluation

Monitoring and evaluation is an approach that is applied both internationally and domestically to track progress toward addressing climate change (Feinstein 2017). This section reviews the definitions, functions, and theories of monitoring and evaluation.

2.1.1. Monitoring

The literature converges around common definitions of "monitoring," which generally focus on practical information gathering exercises that support goal achievement. The Organisation for Economic Cooperation and Development (OECD) (2002) defines monitoring as a "continuous function that uses the systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing development intervention with indicators of the extent of progress and achievement of objectives." Mertens and Wilson (2019) defines monitoring as "observing and reviewing the progress of a program over a period of time to see if it is achieving its objectives." Similarly, the United Nations Development Programme's *Handbook on Planning, Monitoring and Evaluating for Development Results* (2009) provides the following definition and explanation for monitoring: "Monitoring can be defined as the ongoing process by which stakeholders obtain regular feedback on the progress being made toward achieving their goals and objectives. Contrary to many definitions that treat monitoring as merely reviewing progress made in implementing actions or activities, the definition used in this Handbook focuses on reviewing progress against achieving goals…not only concerned with asking "[a]re we taking the actions that we said we would take?" but also, "[a]re we making progress on achieving the results that we said we wanted to achieve?""

2.1.2. Evaluation

In mainstream literature, Scriven (1991) provides a general definition of evaluation, stating that: "evaluation is the process of determining the merit, worth and value of things, and evaluations are the products of that process." Narrowing in to focus on policy evaluation—which is relevant to this thesis as NDCs are foundational policy statements of national governments—Crabbé and Leroy (2008) define evaluation simply as "a scientific analysis of a certain policy area, the policies of which are assessed for certain criteria, and on the basis of which recommendations are formulated." In response to the latter

definition, Huitema et al. (2011) argue that it is not necessary to limit the concept of policy evaluation to 'scientific evaluation,' as "policy evaluation can be performed by non-scientists such as consultancy firms, lobby groups, and politicians." Policy evaluation need not produce policy recommendations; rather, they can target the needs of other actors. Vedung (1997) defines evaluation as the "careful retrospective assessment of the merit, worth and value of administration, output and outcome of government interventions, which is intended to play a role in future, practical action situations" (Vedung 1997). As recognised by Mickwitz (2003), an important feature of this latter definition is that it focuses on retrospective assessment, which is somewhat limiting in the context of environmental policy where pre-evaluation is particularly important (for example, environmental impact assessments that are now mandatory in many countries) (Mickwitz 2003). Accordingly, Mickwitz (2003) extends Vedung's definition of evaluation to include ex ante assessment. Similarly, Uitto et al. 2017 defines evaluation as a "judgement of the value or worth of the what's being evaluated…[which] can take several forms: it can be formative, looking into the ways an intervention is implemented in order to identify ways in which the intervention and its performance could be improved; summative to determine the extent to which the intervention has achieved its anticipated desired results; and/or prospective, assessing the likely outcomes of proposed interventions a priori."

2.1.3. Juxtaposing "Monitoring" and "Evaluation"

In juxtaposing the definitions of 'monitoring' and 'evaluation', it is evident that their purposes are different yet complementary. Kusek and Rist (2004) explain that "monitoring gives information on *where* a policy, program, or project is at any given time (and over time) relative to respective targets and outcomes. It is descriptive in intent. Evaluation gives evidence of *why* targets and outcomes are or are not being achieved." Evaluation enhances monitoring in that it contextualises the monitoring results, helping to support feedback and learning.

2.1.4. The Theory Behind Monitoring and Evaluation

Monitoring and evaluation is rooted in theory. This subsection firstly examines the broader theory behind evaluation, and then narrows in to focus on a part of evaluation theory that is associated with monitoring and evaluation, known as "programme theory" or the "theory of change." This section is not exhaustive on all matters relating to theory-based evaluation, but rather provides a flavour of well-known approaches.

The Theory Behind Evaluation

Theory plays multiple roles in evaluation (Donaldson and Lipsey 2006). There are theories of evaluation, program theories, and social science theories—the latter which is inclusive of areas such as development, learning, motivation and social change (Mertens and Wilson 2019). Evaluation theory provides guidance in determining the purposes for evaluation, that is, how and why actors engage in evaluation, as well as what is considered to be acceptable evidence for making decisions in an evaluation (Mertens and Wilson 2019).

Shadish et al. (1991) suggest that evaluation theories should respond to the following questions:

- What do we need to do in order to produce credible knowledge?
- How can we use the knowledge we gain from an evalution?
- How do we construct our value judgements?
- What do we evaluators actually do in practice?
- What is the nature of social programs and their roles in solving societal problems?

Some scholars suggest that evaluation theories may be more appropriately called "approaches" or "models," since there is limited literature that focuses on the use of particular procedures to achieve desired outcomes (Alkin 2013; Stufflebeam and Shinkfield 2007; Mertens and Wilson 2019). Approaches can be thought of as "a set of rules, prescriptions, and guiding frameworks that specify what a good or proper evaluation is and how it should be done" (Alkin 2013). It is a way of structuring and undertaking analysis in evaluation (Centre of Excellence for Evaluation 2012).

Huitema et al. (2011) notes two well-known evaluation approaches: the *rationalist* approach and the *constructivist* approach. The rationalist approach allows users to assess whether goals are being met or not in order to inform new policy making practices. The constructivist approach, conversely, stresses the autonomous character of policy, where the goal of policy evaluation is more to offer insights for various actors to make sense of the world around them, including the nature of problems and the performance of policies. Recent literature has made attempts to bridge the gap between the two approaches under three issues: *complexity*, acknowledging that modern-day problems are complex; *reflexivity*, recognizing that the choice of approach should depend on the object of evaluation and the objective; and *participation*, accepting that the involvement of stakeholders should be part of an evaluation process (Fischer 1995; Pawson 2006; Huitema et al. 2011). Some critical issues do, however, still need to be resolved and it is unclear whether and how the two approaches can be combined into common approach (Huitema et al. 2011).

In absence of clear consensus on evaluation theory, many researchers and policymakers have followed their own justifiable methods, much along the lines of the military metaphor proposed by Shadish et al. (1991): "Evaluation theories are like military strategies and tactics; evaluation methods are like military weapons and logistics. The good commander needs to know strategy and tactics to deploy weapons properly or to organise logistics in different situations. The good evaluator needs theories for the same reasons in choosing and employing methods. This will ensure that evaluations are performed in an adequate, sensible, appropriate, and efficient manner."

The Theory Behind Monitoring and Evaluation

Monitoring and evaluation is often linked to program theory, which is also known as the "theory of change" (Centre of Excellence for Evaluation 2012; McKinnon and Hole 2015). Program theory focuses on developing a causal chain that links inputs and activities to a chain of intended or observed outcomes, and then using this model to guide the evaluation (Kanyamuna and Phiri 2019).

In early literature, program theory was largely used to identify and quantify variables that have an impact on program outcomes—in essence, to examine cause-effect relationships to achieve desired results (Mertens and Wilson 2019). Over time, researchers expanded program theory to develop ways of

describing what is being evaluated, known as logic models, logic frames, or a logical framework approach. A logical framework approach is a description of the inputs, resources, assumptions, activities, outputs, and impacts of a program being evaluated—all linked with a coherent theory of change (Mertens and Wilson 2019).

A logical framework approach is often combined with results-based management, which makes the approach more practical, and, as the name suggests, performance-oriented. The main emphasis of results-based management is the achievement of higher-level outcomes, typically over longer time periods (Kanyamuna and Phiri 2019).

Results-based management and the logical framework approach are commonly used for climate change monitoring and evaluation—for example, see Lamhauge et al. (2012), which analyses a range of country and development cooperation experiences. Accordingly, results-based management and the logical framework approach will be used as the theoretical basis for developing a framework for effective tracking of NDCs (see Chapter 4). These concepts are also further defined and expanded in section 4.1.

2.1.5. Monitoring and Evaluation of Actions to Address Climate Change

National governments have a long history in monitoring, evaluating, and communicating progress on their actions to address climate change. Initially, much of this work was driven by formal reporting to the UNFCCC (UNFCCC 1992) (read more in section 2.2). National governments are, however, increasingly seeing the value climate change monitoring and evaluation, beyond meeting multilateral reporting obligations. Climate change monitoring and evaluation can support a range of domestic objectives, including promoting climate change action and supporting evidence-based decision making (Aldy 2014; de la Torre et al. 2018) (read more in section 2.3).

Historically, mitigation monitoring and evaluation has been fairly straightforward, at least from an international reporting perspective. It typically focuses on GHG emissions and quantification of the GHG impacts of policies and actions, which, in turn, is intended to draw out lessons on mitigation policy effectiveness, if done well. The methodologies are well-established. For example, the IPCC provides guidance for compiling GHG inventories (IPCC 2006). International research organizations have deepened thinking on quantifying the impacts of policies and actions (for example, Rich et al. 2014; ICAT 2018). National governments, both developed and developing alike, have extensive experience in reporting their GHG emissions and progress toward mitigation goals.

While not the focus of this thesis, it is worth noting that adaptation monitoring and evaluation is less developed than mitigation monitoring and evaluation. Adaptation monitoring and evaluation remains a rather vague concept whose boundaries have yet to be defined. This has been due to two reasons: first, adaptation monitoring and evaluation is fairly broad, with many different approaches in defining its scope; and second, there is a general lack of clarity regarding the identification of targets and the choice of indicators used to monitor performance (Lamhauge et al. 2012). Accordingly, much literature has been published on adaptation monitoring and evaluation to support policymakers in developing better and more effective approaches, including lessons from specific countries (Klostermann et al. 2015) and lessons from development cooperation agencies (Lamhauge et al. 2012).

2.1.6. Users of Monitoring Information

The information produced from mitigation monitoring and evaluation systems was initially only used by national governments to track progress toward addressing climate change, design appropriate policies, and respond to international reporting requirements—and indeed, the focus of this thesis in on national governments. It should be noted, however, that new users of mitigation information have emerged recently, collectively known as non-Party stakeholders, which include companies, cities, subnational governments, civil society, financial institutions, and independent climate change advisory bodies (Weber et al. 2018). These users have different objectives and, resultingly, different needs for monitoring information. For example, companies, cities, and subnational governments are increasingly focused on their individual contributions toward meeting global mitigation goals, spurred through initiatives such as the Marrakech Partnership for Global Climate Action (UNFCCC 2020d) and the emerging concept of "science-based targets" (Krabbe et al. 2015). Civil society plays a key role in advocating for ambitious laws and policies, and actions to address climate change, as well as in holding governments to account on their commitments, and therefore require evidence to evaluate action. Financial institutions are increasingly aware of how climate change and the energy transition may affect the financial performance of companies and associated investments, and accordingly require data to evaluate risks (Task Force on Climate-related Financial Disclosures 2017). Finally, independent climate advisory bodies can strengthen climate governance by using evidence to inform policymaking (more than 40 countries have introduced advisory bodies on climate change) (Averchenkova et al. 2018). Having now established the purpose and definition of monitoring and evaluation, identified program theory as the main theory of monitoring and evaluation, reviewed how monitoring and evalution is applied in the climate change context, and identified different users of monitoring information, this literature review now turns to the history and evolution of goal tracking under the UNFCCC.

2.2. History and Evolution of Goal Tracking under the United Nations Framework Convention on Climate Change

2.2.1. Tracking Progress Toward the Objectives of the United Nations Framework Convention on Climate Change

The UNFCCC was established in 1992 and entered into force in 1994 with the ultimate objective of preventing dangerous human (anthropogenic) interference with the climate system (UNFCCC 1992). This is to be achieved by stabilizing greenhouse gas concentrations in the atmosphere within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner (UNFCCC 1992). The UNFCCC now has near-universal membership, with 197 Parties ratifying the Convention (UNFCCC 2020c).

Under the Convention, all Parties are obliged to communicate to the Conference of the Parties (COP) information relevant to the implementation of the Convention through national communications (UNFCCC 1992, Article 12). This includes information on GHG emissions and actions to reduce them, as well as on adaptation and means of implementation such as finance, technology transfer and capacity-

building. The information helps to provide an accurate picture on the progress of climate action and informs future COP deliberation and guidance on these matters (UNFCCC 2020c).

2.2.2. The Bali Action Plan and Introduction of Measurement, Reporting and Verification

Tracking progress toward climate changes goals under the UNFCCC has evolved over the last three decades. A significant milestone was reached in 2007 through the establishment of the Bali Action Plan, which introduced the principle of measurement, reporting and verification (MRV) to promote the transparency of national emission-mitigation targets, policies, and/or actions (UNFCCC 2007).

The Bali Action Plan did not contain a precise definition of MRV, which made the international negotiations difficult initially (Boyd et al. 2013). A small body of literature published after 2007 attempted to fill this gap by providing clearer definitions of what constitutes MRV activities, what actions to MRV, who conducts MRV, and how to MRV (Breidenich and Bodansky, 2009; Fransen 2009; Ellis and Moarif 2009; Niederberger and Kimble 2011; Pew Center 2010; Winkler et al. 2008). Seven years later, in 2014, the UNFCCC provided precise definitions of "measurement," "reporting," and "verification," as follows:

> *Measurement* applies both to efforts to address climate change and to the impacts of these efforts, including the level of GHG emissions by sources and removals by sinks, emission reductions and other co-benefits (UNFCCC 2014).
>
> *Reporting* includes information on GHG inventories, adaptation, mitigation actions and their effects, constraints and gaps, support needed and received, and other information considered relevant to the achievement of the objectives of the Convention (UNFCCC 2014).
>
> *Verification* is addressed at the international level through a review of national climate change reports, which are submitted by Parties every two years (UNFCCC 2014). For developing countries (non-Annex 1 Parties), this is technically known as International Consultation and Analysis (ICA) of Biennial Update Reports (BURs). One of the primary objectives of this process is to encourage the presentation of information relating to mitigation actions and support received in a *consistent*, *transparent*, *complete*, *accurate* and *timely* manner, considering specific national and domestic circumstances (UNFCCC 2011). These quality criteria derive from international negotiations and guidance from the Intergovernmental Panel on Climate Change (IPCC) (IPCC 2006).

Academics and civil society organizations have continued to contribute to growing research on climate change MRV. For example, Singh et al. (2016) unpacked MRV activities for climate change mitigation; the Initiative for Climate Action Transparency released a series of guidance documents to assess the GHG, sustainable development and transformational impacts of mitigation policies and actions (ICAT 2019).

2.2.3. The Paris Agreement and Enhanced Transparency Framework

The Paris Agreement was adopted in December 2015, which established new goals for addressing climate change (UNFCCC 2015). Article 13 of the Paris Agreement also established an updated means of tracking progress toward the new global goals, known as the "enhanced transparency framework for action and support." The main objective of the framework is to provide a clear understanding of climate change action; that is, to understand progress toward individual Parties' contributions, as well as the collective goals agreed to under the Paris Agreement. The framework includes built-in flexibility which considers Parties' different capacities and builds upon collective experience (UNFCCC 2015). In this case, "collective experience" refers to academic literature and early work on MRV under the UNFCCC. For example, Breidenich and Bodansky (2009) identified considerations for the MRV of emission targets and non-target mitigation actions; Bodansky and Diringer (2014) identified possible information requirements for reporting progress on implementing NDCs.

Paragraph 7(b) of Article 13 states that "each Party shall regularly provide…information necessary to track progress made in implementing and achieving its nationally determined contribution under Article 4." This is a mandatory reporting requirement (note the word "shall"), establishing an obligation for all Parties to track and report progress on their NDCs. The accompanying COP decision gives greater specificity to the term "regularly," by providing that all parties, except for least developed and small island states, shall report on at least a biennial basis (Decision 1/CP.21, paragraph 90). The reference to Article 4 in Article 13.7(b) suggests that the scope of NDC tracking is mandatory for mitigation only, although other parts of Article 13 referring to NDCs are not specified as clearly, and capable of the broader interpretation of NDCs (Winkler et al. 2017). For this thesis, NDC tracking is focused on mitigation only.

Scholars have unpacked the provisions of the Paris Agreement, for example, by providing legal analyses in the form of article-by-article commentary (Klein et al. 2017; Dagnet and Levin 2017). In addition, an expanding body of literature has focused on the enhanced transparency framework. Some researchers have examined Article 13 comprehensively, considering implications for further work at the domestic and international levels (van Asselt, et al. 2016; Winkler et al. 2017; Dagnet and Levin 2017). Others have explored the role of economic models to support the transparency regime, particularly in the early years before the formal procedures are agreed (Jacoby et al. 2017). There is limited academic literature focused on tracking progress toward NDCs specifically (i.e. Article 13.7(b)), given that the Paris Agreement dates only to 2015.

Post 2015, policymakers and researchers deepened thinking on the "modalities, procedures, and guidelines" (MPGs) for the enhanced transparency framework, which includes Article 13.7(b). The MPGs were intended to elaborate on the provisions of Article 13—including the ways and means to track progress toward NDCs—and build on experience from the arrangements related to transparency under the Convention (UNFCCC 2015). Grey literature, intended to inform the development of MPGs, includes papers from the Climate Change Expert Group on enhancing transparency (Briner and Moarif 2017), information needed to facilitate the clarity, transparency, and understanding of mitigation contributions (Moarif 2017), possible structures of mitigation-related MPGs (Briner and Moarif 2017), and accounting for mitigation targets in NDCs (Hood and Soo 2017). The UN Environment Programme analysed the

reporting requirements under the enhanced transparency framework to enhance the knowledge of policymakers (Desgain and Sharma 2016). The European Capacity Building Initiative reviewed key questions and offered recommendations to inform the design of the MPGs (van Asselt et al. 2016; van Asselt et al. 2017). The Project for Advancing Climate Transparency also published a series of resources to advance thinking, including papers on reporting (Elliott et al. 2017), review (Dagnet et al. 2017a), and mapping the linkages between the transparency framework and other provisions of the Paris Agreement (Dagnet et al. 2017b).

At COP24 in 2018, negotiators agreed on the MPGs for the enhanced transparency framework, known as the Katowice Climate Action Package (UNFCCC 2018). Relevant to the central research question of this thesis, the MPGs include a section on requirements for tracking progress made in implementing and achieving NDCs. The general tenor of the section is "shall, as appropriate" (Winkler, comments to author on thesis, February 20, 2019), meaning that all countries are required to comply with the rules. Broadly speaking, countries will be required to describe their national circumstances, institutional arrangements, and NDC. They will be required to select tracking indicators, report on information relevant to those indicators, and provide information on actions, policies and measures that support the implementation and achievement of the NDC (UNFCCC 2018). But countries still have options. They choose when they start reporting, which indicators they use to track progress toward their NDCs, and how much information to include in their reports to the UNFCCC. All countries will be required to report on progress toward their NDC as part of their biennial transparency reports (BTRs), the first of which to be submitted to the UNFCCC by the end of 2024 at the latest (UNFCCC 2018). (The BTRs will replace the current Biennial Reports submitted by developed country Parties and BURs submitted by developing country Parties.) The BTRs will undergo technical expert review (TER), with teams of experts either visiting the country or undertaking desk-top reviews – the reports of which form part of a facilitative multilateral consideration of progress (FMCP) (Winkler et al. 2019). The BTRs are also a key source of information for the five-yearly global stocktake, which assesses progress toward the collective goals under the Paris Agreement.

Some developing country Parties will require additional capacity to meet the requirements of the enhanced transparency framework and complete BTRs.[3] The decision text accompanying the Paris Agreement therefore established a Capacity-building Initiative for Transparency (CBIT) in order "to build the necessary institutional and technical capacity" to support developing country Parties in meeting the enhanced transparency requirements (UNFCCC 2015, Decision 1/CP.21, paragraph 84). Moreover, when reporting through BTRs, developing country Parties will be required to "concisely clarify capacity constraints" and "provide self-determined estimated time frames for improvements" (UNFCCC 2018, Annex, paragraph 6), with the intention of facilitating improved reporting and transparency over time.

With the MPGs only recently agreed, there is limited literature on the capacity building requirements of the enhanced transparency framework. Some scholars, however, suggest that developing country Parties may struggle for some time with internal capacity constraints (Khan et al. 2020), which could be

[3] The challenge of ever more regular and comprehensive reporting can be discerned from that fact that as of writing this thesis (May 2020), only 56 (out of 156) developing countries had submitted first BURs, 31 countries had submitted second BURs, and 10 countries had submitted third BURs (UNFCCC 2020a). All developing country Parties were invited to submit their first BUR before the end of 2014.

exacerbated by a lack of adequate financial support. For example, requests to the CBIT exceed resource availability in 2018 (Weikmans et al. 2020). Accordingly, some observers note that in addition to providing financial support, the CBIT will need to coordinate several initiatives that seek to meet the capacity related needs of the developing countries, so as to be effective and maximise synergies (Winkler et al. 2017). Previous experience has also shown that technical reviews can place a significant burden on Parties, expert reviewers, and the UNFCCC Secretariat, and that they require significant financial and human resources (Weikmans et al. 2020).

Having understood the history and evolution of tracking goal progress under UNFCCC, including the minimum requirements for NDC tracking and capacity constraints, this review now turns to what the literature suggests makes tracking goal progress "effective."

2.3. Effective Tracking of Goals

Scholars have considered what it means to "effectively" track progress toward the implementation and achievement of goals. The literature converges around two central and related themes of effectiveness:

First, effective goal tracking *provides a clear understanding* of policies and actions taken to meet stated goals. It helps to assess and compare the performance of policies and actions, enable adaptive learning, and evaluate alternate policy instrument designs (Weiner 2015). Effective goal tracking enhances policy relevance as it can address questions of why (or why not) interventions achieved intended impacts (White 2009). Effective goal tracking helps to inform policy and decision-making and can be a powerful tool for motivating further action (Winkler et al. 2019).

Second, effective goal tracking *promotes trust and accountability*. Effective goal tracking produces credible information for use by all relevant actors (Aldy 2014), which is important to build trust (Winkler et al. 2019), both domestically and with other countries. "National governments are more likely to take stronger action within an international agreement to combat climate change if they have clear assurances and understanding that all countries will be making a fair contribution to collective action" (Aldy and Pizer 2016). Moreover, literature across several disciplines shows how transparency can reduce uncertainty and prevent deviation from an agreement, thus "enabling a set of reciprocal actions to deliver on a global public good" (Aldy 2014).

2.4. Applying the Learnings from the Literature Review

The monitoring and evaluation of climate change action is relatively new, and its development has been slow compared with other realms. Many practices are still not well standardised and indeed are still developing and evolving under the UNFCCC. The NDCs introduced under the Paris Agreement in 2015, along with the enhanced transparency framework, will bring about changes to how countries track and report progress toward their climate change commitments.

Monitoring and evaluating climate change can be challenging and complex. Climate change is a "super wicked" problem: time is running out; those who cause the problem also seek to provide a solution; the central authority needed to address it is weak or non-existent; and, partly as a result, policy responses

discount the future irrationally (Levin et al. 2012). Climate change policies and actions frequently span multiple sectors that aim to affect not just environment but also poverty, livelihoods, health, income and jobs, hunger, and food security, which aim to affect both immediate and future outcomes (Uitto et al. 2017). Efforts to tackle climate change are also often characterized by very long timeframes between actions and their ultimate consequences, meaning that it can be difficult to establish tight feedback loops.

The examination of existing climate policy monitoring and evaluation systems offers an opportunity to understand the challenges that have emerged in previous tracking exercises and are likely to persist in the future—and how these might be overcome (see example in Box 1). Additionally, focusing on "effectiveness" as a means of designing monitoring and evaluation systems—including NDC tracking frameworks—can support goal tracking by providing all actors with a clear understanding of climate change actions, while promoting trust and accountability.

With this literature review as foundation, the thesis now turns to the methods used to investigate the central research question of this thesis.

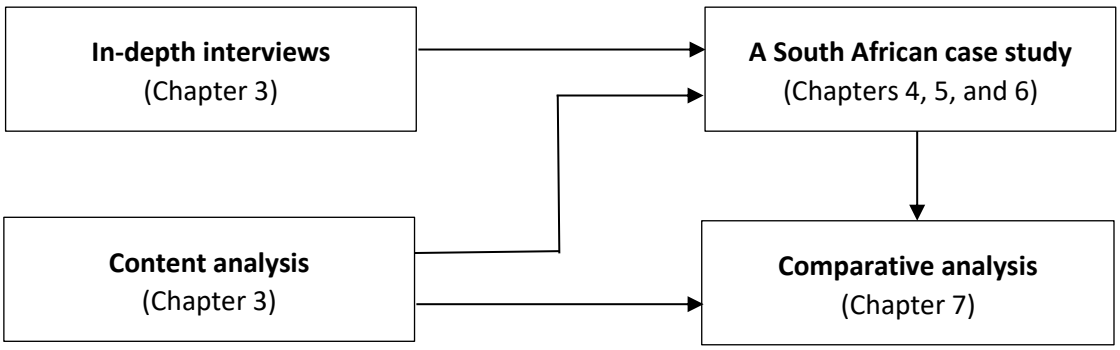
Box 1 | Lessons from the European Union's monitoring system

Scholars have assessed the European Union's monitoring system and conclude that "key obstacles to more in-depth reporting include not only political concerns over reporting burdens and costs, but also struggles over who determines the nature of climate policy monitoring, the perceived usefulness of reporting information, and the political control that policy knowledge generates" (Schoenefeld et al. 2016). To overcome some of these challenges, Fujiwara, Böβner and van Asselt (2018) recommend that existing and future policy evaluations could be saved in single central databases with open access to researchers and policymakers. This could avoid duplication of efforts, reduce redundancy and repetitiveness of climate policy evaluations, and allow for the sharing of lessons learnt more efficiently. More inclusive and participatory approaches to policy evaluations could also enhance their usefulness by allowing non-government actors a voice to share their views and experiences when analysing policies. Reporting the potential co-benefits of acting on climate change (for example, health or economic competitiveness) can additionally prove a useful means to gain political support (Jordan et al. 2015).

3. Methodology

The central research question of this thesis explores: "How can tracking progress toward the mitigation targets in NDCs be most effective?" To answer this question, the thesis uses a case study on South Africa as one key method to develop a tool (framework) for effective NDC tracking. The tool is applied to six other developing countries through comparative analysis. Both content analysis and in-depth interviews inform the case study, while only content analysis informs the comparative analysis. The methodological framework with accompanying chapter numbers is depicted in Figure 1 and described further in sections 3.1 – 3.4.

Figure 1: Methodological Framework, including Chapter Numbers



3.1. Content Analysis

Following the literature review, content analysis of the Paris Agreement and related COP decisions (UNFCCC 2015; UNFCCC 2018) was done to understand the specific international requirements for tracking and reporting progress toward NDCs. In this instance, specific words in the Agreement and decision texts were coded to understand what countries must do (i.e. "shall"), what is recommended (i.e. "to the extent possible" and/or "could include"), what is optional (i.e. "may"), and when something is considered context-specific (i.e. "as applicable" and/or "as available"). This helped to define the minimum requirements for the NDC tracking at the international level, as a base to develop the NDC tracking framework in this thesis.

The documents published by the South African government that are relevant to the country's monitoring and evaluation (M&E) system were also carefully reviewed, to better understand current mitigation goals and means of tracking goal progress. This included the Copenhagen Pledge (DEA 2010), the NDC (Government of the Republic of South Africa 2015), biennial update reports (DEA 2014; DEA 2017a; DEA 2019b), annual climate change reports (DEA 2016; DEA 2017b); government regulations (Government of the Republic of South Africa 2017a; Government of the Republic of South Africa 2017b), the national climate change response M&E system framework (DEA 2015), and the national climate change response white paper (Government of the Republic of South Africa 2011).

For the comparative analysis, the BURs from the six countries were examined to collect information relevant to each country's M&E system. This includes each country's mitigation goals (both the Copenhagen pledge for 2020 and the NDC for 2030), indictors used to track current mitigation goals, the type of information collected for mitigation goal tracking and the means of collecting that information, any demonstrated links between outputs of climate change M&E work and national policy, and latest available GHG inventory data.

3.2. Interviews

Interviews were the method of gathering primary data for this research. This is because interviews collect relevant in-depth information, which is not always possible by analysing publicly available documents or through another type of research method, such as survey. Interviews also provide a means to gather viewpoints and opinions. Since NDC tracking is fairly new, it is useful to understand different perspectives on what, exactly, would make NDC tracking effective and why.

The selection of key respondents to interview for this research was driven by two main considerations. First, the interviewees must have a reputation as thought leaders in the area of mitigation goal tracking. Second, the set of respondents must cover the distinct perspectives of four major groups of stakeholders, defined as follows:

1) *Government*, meaning that the individual has worked or is currently working for the M&E unit at South Africa's Department of Environment, Forestry and Fisheries[4] (the team responsible for national mitigation goal tracking).
2) *Business*, meaning that the individual's work in South Africa is, to some degree, impacted by the mitigation goal tracking done by government.
3) *Academic*, meaning that the individual has deep knowledge about the Paris Agreement and mitigation goal tracking, perhaps working for a university or similar.
4) *Civil society,* meaning that the individual also has deep knowledge about the Paris Agreement and mitigation goal tracking, but working for a research organization, non-governmental organization, or similar.

Ethics clearance was received prior to contacting any potential interviewees. This meant describing any ethical issues involved in the proposed research and the measures taken to deal with any negative implications of these issues. It also included an explanation of how confidentiality and anonymity will be ensured. The Faculty of Engineering and the Built Environment at the University of Cape Town approved the ethics clearance application in November 2018.

In May 2019, twelve people were approached to interview, which met the criteria above. Potential interviewees were contacted via email, which set out the research objectives and the purpose of the interviews. Eleven people accepted and provided written informed consent to participate in the

[4] This thesis refers extensively to the work of the monitoring and evaluation unit in South Africa's Department of Environment, Forestry and Fisheries (DEFF). Prior to June 2019, DEFF was named the Department of Environmental Affairs (DEA). In June 2019, DEA incorporated the forestry and fisheries functions from the previous Department of Agriculture, Forestry and Fisheries. This thesis refers to both DEA and DEFF, whichever is correct at the time of reference.

research. In providing their consent, participants confirmed that (a) their participation in the research was entirely voluntary; (b) the interview would be recorded for the purposes of transcribing the interview only; (c) the responses provided in the interview would help shape the research and conclusions reached; and (d) all direct quotes used in the thesis would be anonymous (i.e. the individual would not be named), but responses will be categorized into stakeholder grouping. In this thesis, references to anonymous interviews are presented as in-text citations (and not in the reference list since these are unpublished), in accordance with the Chicago Manual of Style. Further details about the interviews are presented in Appendix 1.

Participants were interviewed separately by phone in May and June 2019. All interviews lasted over an hour. At the beginning of each interview, there was a brief summation of research approach and objectives, and reconfirmation that the interview could be recorded for transcription purposes only. Informed by the literature review and content analysis, the topics set for the interviews were designed to capture relevant background information that is not possible by analysing publicly available documents. This includes the current status of M&E in South Africa, the capacity and skills of officials tasked with M&E, data collection procedures, and options for tracking progress toward NDCs. Interviews also explored participants' views regarding what would make NDC tracking "effective."

The in-depth interviews were conducted in a semi-structured format, with a common set of questions shared with participants ahead of time (Appendix 2). Some questions were multiple choice, allowing for direct comparison among participant responses. Other questions were open ended, particularly those that were opinion-based, allowing room for discussion and follow-on questions as they arose. The interviews were transcribed, verbatim, and shared with participants directly following the interview for approval of accuracy. Interview records were stored on a computer and in the cloud (as backup)—both in password protected files to maintain confidentiality.

The first step in analysing the transcripts was to get familiar with the information and identify areas of convergence and divergence among participant responses. The type of information collected from the interviews fell into two categories:

The first category is subjective information, where participants were asked for their views on what would constitute effective NDC tracking. For these responses, thematic analysis was done to interpret the information. Responses were coded into various themes of "effectiveness." A deductive approach was used, meaning that, based on the literature review, there were preconceived ideas about the themes that might be found. The information gathered from this first category—in conjunction with content analysis of key documents and relevant theory from the literature—was used to develop a tool (framework) for effective NDC tracking (see Chapter 4, also read more in section 3.3).

The second category was objective information, historical and fact-based. This includes, for example, the decisions that the government made in the development of South Africa's M&E system and its current status. This information provides useful context for addressing the central research problem and did not require further interpretation—there were no points of divergence among participant responses. The information gathered from this second category—in conjunction with content analysis of key

documents—was used to test the NDC tracking framework on South Africa (Chapter 5) and identify opportunities for improvement (Chapter 6).

3.3. In-depth Case Study of South Africa

A core methodology of this thesis is a case study approach. A case study is chosen because it lends well to research questions related to "how." It is exploratory by nature, rather than examining frequencies or incidence, which are typically better suited to experiments or surveys (Yin 2009). A case study collects in-depth and detailed information from multiple sources (Stjelja 2013). Indeed, case study research is often referred to as a comprehensive research strategy, rather than a singular research method in itself (Yin 2009). If done well, a case study will combine different research techniques, which is often referred to as "triangulation" (Yin 2009). In so doing, a case study offers opportunities to gather rich and potentially complex insights, which are anchored in real-life situations (Stjelja 2013). These insights can be also "construed as tentative hypotheses that help structure future research, meaning that case study research plays an important role in advancing a field's knowledge base" (Merriam 2009). This is important because tracking progress toward NDCs is nascent, with limited literature focused this topic, given that the Paris Agreement dates only to 2015.

South Africa is selected as the subject of the case study, chosen for several reasons. The candidate is South African. This thesis is undertaken with a South African university. But there are other reasons too. South Africa is a major emerging economy. The country is involved in various multilateral groupings relevant to climate, such as the African Union, the African Ministerial Conference on the Environment, the African Group of Negotiators, BASIC, and the G20. South Africa also plays a significant role in international negotiations. According to scholars, South Africa's "history and role as a pre-eminent African economy have shaped an international profile which outweighs the size of its economy or its population." (Rennkamp and Marquard 2018). The country hosted the Conference of Parties in 2011, which established the mandate for the negotiation process that led to the Paris Agreement (the Ad Hoc Working Group on the Durban Platform for Enhanced Action) (UNFCCC 2011). South Africa also chaired the G77 and China during the year that the Paris Agreement was adopted (G77 & China 2015). South Africa is currently within the top twenty of annual absolute GHG-emitting countries (including LULUCF), with emissions that continue to grow like many other developing nations (CAIT 2020). South Africa also has established an M&E system for tracking progress toward climate change goals, which continues to evolve and improve over time (DEA 2015). These factors combined make South Africa an appropriate case from which to examine the central research question of this thesis.

The case study comprises three parts: First, drawing from the literature review, interviews, and content analysis, the case study develops a tool (framework) for effective NDC tracking (Chapter 4). The tool is then used to evaluate the effectiveness of NDC tracking in South Africa, by undertaking a systematic analysis to assess the extent to which the criteria of the framework are met (Chapter 5). Based on the gaps identified in Chapter 5, Chapter 6 then offers recommendations for enhancing arrangements for effective NDC Tracking in South Africa.

3.4. Comparative Analysis

While a case study is useful examine real-life situations, develop theory, and evaluate programs (Yin 2009), it has limitations as well. The most common critique is that case studies can be difficult to generalize from one case to another (Stjelja 2013). To address this critique, this thesis includes qualitative comparative analysis.

Qualitative comparative analysis "combines strong points of both qualitative and quantitative methods, aiming to gather in-depth insights into different cases to capture their complexity, whilst at the same time attempting to produce some form of generalization" (Befani 2013; Rihoux and Lobe 2009). It is a means of systematically comparing cases to identify prevalent patterns and redundant conditions (Pattyn et al. 2017).

In this thesis, qualitative comparative analysis is applied to cases in Brazil, Chile, Lebanon, Namibia, the Republic of Korea, and Singapore. The aim is to identify context-specific factors in the South African case study and clarify the applicability of the tool (framework).

Having outlined the research method to investigate the central research question, the next chapter develops a framework for effective NDC tracking.

4. A Framework for Effective Tracking of Nationally Determined Contributions

The literature review revealed that program theory, also known as theory of change, is the theoretic basis for monitoring and evaluation (see section 2.1.4). The literature review also revealed that a component of program theory—results-based management with the logical framework approach—is commonly applied by national governments for climate change M&E. This approach helps to ensure that tracking is performance-oriented and supports the achievement of set objectives.

Results-based management, combined with the logical framework approach, will be used as the basis to design a framework for effective NDC mitigation tracking—after all, NDC tracking is a form of climate change M&E. Recognizing that there are many users of mitigation monitoring information,[5] each with different objectives, this framework is designed with to meet the needs and objectives of the primary user (and developer) of information for NDC tracking—a national government's environmental department.

This chapter is structured as follows: first, the concepts of results-based management and the logical framework approach are defined (section 4.1), and subsequently applied to design a framework for NDC tracking (section 4.2). Key "effectiveness" criteria, to be applied in the framework, are established based on information collected from literature and the in-depth interviews (section 4.3). A summary and ideas for future work concludes the chapter (section 4.4)

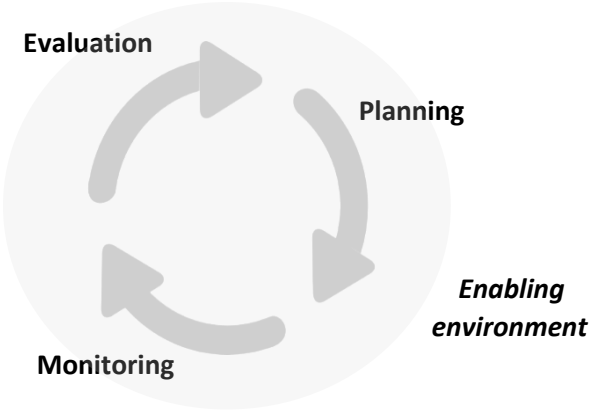
4.1. Defining Results-Based Management and a Logical Framework Approach

4.1.1. Results-Based Management

Results-based management is a strategy that has a strong focus on performance and the achievement of outcomes and impacts (Lamhauge et al. 2012). It typically involves several phases, for example, articulating and agreeing on objectives, selecting indicators, and setting targets, monitoring performance (i.e. collecting data on results), and analysing and reporting those results (Binnendijk 2000). Results-based management can be an iterative process, with the outcomes informing the selection of indicators and targets, helping to achieve results and support continual improvement—all set within the context of an enabling environment. A simple schematic of results-based management is presented in Figure 2. Since results-based management is a broad strategy, it is well suited to monitoring and evaluating a range of objectives and activities, including tracking progress toward NDCs.

[5] Users of mitigation monitoring information include national governments, sub-national governments, cities, companies, civil society, research organizations, academia, development agencies, and financial institutions.

Figure 2: Simple Schematic of Results-Based Management



4.1.2. A Logical Framework Approach

The logical framework approach is a means to align a hierarchy of objectives, each with a different focus and scope, into a coherent theory of change (Bakewell and Garbutt 2005). The logical framework approach supports results-based management by establishing a methodological approach for assessing performance. Its distinguishing feature is a matrix, or logical framework (logframe) (Bakewell and Garbutt 2005), which consists of:

- a vertical logic as a hierarchy of objectives, where *inputs* feed into *processes*, which deliver *outputs*, supporting the achievement of *outcomes*;[6] and
- a horizontal logic showing how progress against each objective can be assessed for each element, by identifying indicators and means of verifying progress.

A typical logical framework, with vertical and horizontal logic, is illustrated in Table 1.

[6] In the logical framework approach literature, there are variations in terminology, for example, some scholars use *objectives* instead of *outcomes*, or *activities* instead of *processes*.

Table 1: A Typical Logical Framework, adapted from Bakewell and Garbutt (2005)

Horizontal logic

Vertical logic

Stage	Indicators	Means of verification
Inputs – What do we need?	Information such as resources, finance, time, and data	Sources to show the provision of information
Processes – How do we go about it?	Measures to show if activities are taking place	Sources of information and methods to show that activities are being completed
Output – What are the results?	Measures to show if outputs are being delivered	Sources of information and methods used to show delivery of outputs
Outcome – What do we achieve?	Measures to show what progress is being made towards reaching the objectives	Sources of information and methods used to show progress against objectives

4.2. Combining Results-Based Management with a Logical Framework Approach for Tracking Nationally Determined Contributions

Results-based management can be combined with a logical framework approach to develop a framework for NDC mitigation tracking. This means that tracking begins with *planning* (i.e. identifying the vision and objectives for NDC mitigation tracking), before establishing a means for achieving that vision through a *logical framework approach,* where inputs feed into processes, which deliver outputs, supporting the achievement of outcomes. NDC mitigation tracking is also situated within an *enabling environment*. The NDC tracking framework is represented graphically in Figure 3.

Figure 3: A Framework for Tracking of NDCs (Mitigation Only)

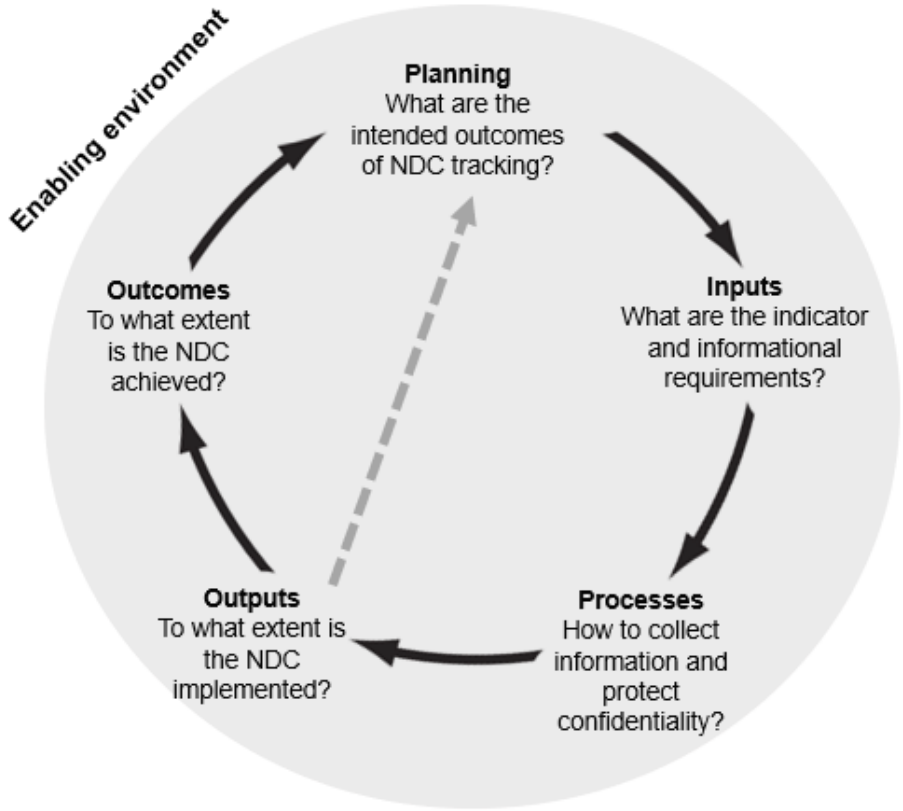


Figure 3 (and the text before Figure 3) show *outcomes* informing *planning* in the NDC tracking cycle. There is, however, also an option to make a tighter cycle, both in terms of steps and time, if, instead, *outputs* inform *planning*. *Outcomes* are typically assessed over longer time horizons (in this case, at the end of the NDC period) and are not necessarily under the control of the country. In the absence of intermediate outcomes, this could mean a very long and ineffective feedback loop. The tighter connection is shown by the grey dotted line in Figure 3, connecting *outputs* to *planning*. *Outputs* are under the control of the actors in the country.

The elements of the framework—planning, the enabling environment, and the logical framework (inputs, processes, outputs, outcomes, performance management)—are elaborated in subsections 4.2.1 – 4.2.3.

4.2.1. Planning

Planning focuses on the intended outcomes of NDC mitigation tracking. This stage provides information about NDC tracking objectives, with the primary focus of supporting the objectives of the environment department in national government (rather than all users of mitigation monitoring information). This could, for example, include meeting international reporting requirements, promoting climate action and evidence-based decision making, and/or other domestic priorities. The planning stage also compares the current status of NDC tracking with the intended outcomes of NDC tracking (i.e. where are we now in

relation to the GHG emissions target, or recent levels for another indicator, for example, gigawatts of renewable energy installed).

4.2.2. The Enabling Environment

NDC tracking will be typically situated within a national government's broader climate change M&E system/arrangements. It is therefore important to examine the enabling environment to ensure that an effective structure surrounds and supports NDC tracking. It is well acknowledged that contextual factors can help an intervention succeed (Center of Excellence for Evaluation 2012). Based on the in-depth interviews, these contextual factors include: a well-defined government vision for climate change action, including high-level political support (Interviews 4, 5); trust between government and data providers that confidentiality will be maintained, and trust between government and the public, where the government demonstrates its commitment to making best efforts to address climate change (Interviews 4, 11); and sufficient capacity and skills within the team tasked with NDC tracking (Interview 11).

4.2.3. A Logical Framework Approach for NDC Tracking: Inputs, Processes, Outputs, and Outcomes

A logical framework approach provides the necessary structure for achieving set outcomes. For this framework, the outcome being sought is the achievement of the NDC mitigation target, meaning that *inputs*, *processes*, and *outputs* of the logical framework are designed in support of this outcome, as elaborated below.

4.2.3.1. Inputs

This stage focuses on the requirements for NDC tracking. These are the indicators used for tracking progress toward the NDCs, which are selected by countries based on international requirements (see UNFCCC 2018, para. 66) and domestic needs. Indicators could, for example, include net GHG emissions and removals, percentage reduction of GHG intensity, and/or relevant qualitative indicators for a specific policy or measure.

4.2.3.2. Processes

This stage considers the management processes and activities that are required to transform inputs into outputs, which in turn support the outcomes and goals of NDC tracking. Processes include information collection procedures and the means for protecting confidentiality.

4.2.3.3. Outputs

This stage focuses on the results of NDC tracking and examines the extent to which the NDC has been implemented. It is about comparing actual performance against a benchmark. Outputs may include current and historical GHG emissions, GHG emissions projections, and assessments of the impacts (GHG and non-GHG) of mitigation policies and actions.

4.2.3.4. Outcomes

This stage evaluates the extent to which the mitigation target of the NDC is achieved. The framework is designed to "track progress"—so during the period of implementation, the outcome is whether the country is on track to meet the mitigation target. The outcome would be reported as likely or unlikely. For example, if the country is 60 percent towards its target halfway through the goal period, the outcome would be reported as likely. Only after the goal period can it be known if the target was achieved. The outcome would be then reported as Yes / No. Since NDCs have technically not yet begun to be implemented (most countries have an official start year of 2021), a helpful proxy outcome may be to evaluate progress toward countries' 2020 commitments, also known as their Copenhagen pledges, which were established in 2009/2010.

4.3. Creating a Framework for "Effective" Tracking of Nationally Determined Contributions

What will distinguish this framework from typical, narrow mitigation tracking efforts (which, for example, only focus on tracking GHG emissions) is the idea of "effectiveness." Effectiveness can be built into the NDC tracking framework in two ways:

First, each of the stages of NDC tracking can be designed to be effective. The following effectiveness criteria are a summation of what scholars define as the elements of effective goal tracking, as well as opinions gathered from key experts through the in-depth interviews (section 3.2).

> In terms of *inputs*, the indicators should be simple and easy to understand, relevant to the desired outcome, precise and measurable, and available at a reasonable cost (Interview 3; Klostermann et al. 2015; Aldy and Pizer 2016) **(Criterion 1)**.
>
> In terms of *processes*, the information collected should be as simple as possible but no simpler (Interviews 2, 6) **(Criterion 2)**. Additionally, there should be legislative support to (a) provide the government with a mandate to collect relevant information and (b) protect the data providers and maintain confidentiality arrangements (Interview 2) **(Criterion 3)**.
>
> In terms of *outputs*, the information produced from NDC tracking should allow government officials to evaluate progress toward the achievement of the NDC **(Criterion 4)**. Consideration of the information produced from NDC tracking should enhance transparency, which is critical to accountability (Interview 6) **(Criterion 5)**. This means that governments can promote credibility and public confidence in their work (Morra Imas and Rist 2009), and external stakeholders can have a clearer sense of the status of policies and actions implemented to address climate change (Kusek and Rist 2004). Finally, a review of outputs should assist all actors in understanding the links between climate mitigation efforts and national social and economic consequences **(Criterion 6)**. This final point links to the second point above, whereby effective outputs of NDC tracking can promote understanding and situate climate change action within a broader context, beyond GHG emissions (Interviews 1, 3, 7, 11).

In terms of *outcomes*, the NDC mitigation target should be successfully achieved **(Criterion 7)**.

Second, as illustrated in, the stages of NDC tracking can be put together in way that the framework as whole is effective. This means the stages interact in a coherent manner, where *inputs* feed into *processes*, which produces *outputs*, to support the achievement of *outcomes*. There is iteration, meaning that *outcomes* inform *planning*, which allows for adaptive management and continual learning and improvement. The framework is performance-oriented to effectively support the achievement of objectives **(Criterion 8)**. The application of the NDC tracking framework will help the government to develop a knowledge base of the types of policies and actions that are successful, better understand the reasons behind their success, and make well-informed decisions to improve policy performance and promote climate action.

The effectiveness criteria are summarised in a logical framework matrix in Table 2, which includes the means of verification.

Table 2: A Logical Framework Matrix for Effective NDC Tracking (Mitigation Only)

Element	Effectiveness Criteria	Means of verification
Inputs	Criterion 1: The indicators are simple and easy to understand, relevant to the desired outcome, and precise and measurable	Indicators
Processes	Criterion 2: Information collection is as simple as possible, but no simpler	Information inputs
	Criterion 3: There is legislative support for collecting data and protecting confidential information	Regulations and legislation
Outputs	Criterion 4: The government can evaluate progress toward the NDC mitigation target by using outputs from the M&E work	Information outputs
	Criterion 5: Transparency is enhanced when using outputs from the M&E work	Information outputs
	Criterion 6: All actors can understand the links between climate mitigation efforts and national social and economic consequences when reviewing the outputs from the M&E work	Information outputs
Outcomes	Criterion 7: On track to achieve the NDC or, as a proxy, on track to achieve the Copenhagen pledge	Current GHG emissions and an assessment of the likelihood of goal achievement
Performance management	Criterion 8: NDC tracking is iterative (performance oriented) and supports continual learning and improvement	Evidence of performance management and continual improvement

4.4. Summary and Areas for Future Work

This chapter has developed a framework for effective NDC mitigation tracking, which is based on program theory. The framework provides a structure for ensuring that NDC tracking is performance-oriented and supports the achievement of set objectives. The framework includes a logical framework

matrix, which, when applied, can help evaluate the effectiveness of existing processes and identify specific areas for improvement.

In response to the central research question of this thesis, the framework shows that NDC mitigation tracking is effective when it begins with planning (i.e. identifying the vision and objectives of NDC tracking), before establishing a means for achieving that vision through a logical framework approach—all set within the context of an enabling environment. There is regular feedback to support continual learning and improvement. NDC tracking is also effective when it furthers national priorities, improves policy performance, enhances understanding and transparency, promotes trust and accountability, and links climate action with socio-economic outcomes (among other issues discussed in section 4.3).

The NDC tracking framework developed in this chapter is constrained to mitigation only, but it could be feasibly extended in future to include adaptation. The theory of results-based management combined with a logical framework approach is already commonly applied to assess, compare, and develop M&E systems for climate change adaptation (for example, see Lamhauge et al. 2012; Klostermann et al. 2015; McKinnon and Hole 2015; and Ssekamatte 2018). Criteria for effective tracking of adaptation contributions could be developed based on a critical analysis of best practices identified in literature, and/or other suitable research methods (for example, see Baker et al. 2012, which develops criteria for assessing the effectiveness of local adaptation plans).

The NDC tracking framework developed in this chapter is also targeted toward a fairly narrow group—the environment department in a national government as the primary user (and developer) of information related to NDC mitigation tracking. The NDC tracking framework is also situated in the context of the international process i.e. a framework that meets international reporting requirements while also being domestically useful and effective. The literature, however, shows that there are an increasingly wide range of users of mitigation monitoring information, including sub-national governments, cities, companies, civil society, research organizations, academia, and financial institutions—each with different objectives (see section 2.1.6). This suggests that further research could be helpful for designing mitigation tracking frameworks that meet the needs of a wide range of domestic users, where the information produced could generate debate about the adequacy of climate policy developments. The theoretical framework of results-based management combined with a logical framework approach could still be applied, but with the selection of different "effectiveness" criteria that will depend on the overall objectives and users of the mitigation monitoring system. Moreover, putting more emphasis on the domestic objectives for mitigation tracking, beyond the NDC, could be a motivator to develop capacities and relevant data that go well beyond international reporting requirements.

The thesis now turns to an application of the NDC tracking framework to South Africa, and, with these results, an identification of the opportunities to enhance domestic arrangements (Chapter 6).

5. Applying the Framework to South Africa

The purpose of this chapter is to apply the framework developed in Chapter 4 to NDC tracking in South Africa. The application helps to illustrate the answer to the overall research question of the thesis by asking "how effective is NDC tracking in South Africa?"

This chapter firstly contextualizes NDC tracking in South Africa by examining the evolution and current status of climate change M&E work in South Africa (of which NDC tracking will form part) (section 5.1), the objectives of NDC tracking in South Africa (section 5.2), and the enabling environment in which NDC tracking will take place (section 5.3).

This question posed in this chapter will be then answered by undertaking a systematic analysis of the extent to which NDC tracking in South Africa currently meets the effectiveness criteria defined in Chapter 4 (section 5.4)—in essence, the application of the logical framework matrix presented in section 4.3.

This chapter is extensively analytical by design, setting the stage for the identification of areas for improvement (Chapter 6) and cross-country comparisons (Chapter 7). The chapter includes detailed information from multiple sources, including publicly available documents (refer to section 3.1) and interviews with key stakeholders (refer to section 3.2).

At the outset, it is important to note that NDC tracking has not yet technically begun in South Africa. While South Africa communicated its intended NDC in 2015, the target period for this contribution technically only commences in 2021. International reporting on progress toward NDCs is also only expected to start in 2024 (at the latest) through biennial transparency reports (UNFCCC 2018). The thesis can, nevertheless, assess progress that South Africa is making toward an earlier international mitigation commitment, the Copenhagen Pledge, which was set at the beginning to achieve by 2020 (DEA 2010). In addition, many of the mitigation measures employed to reach South Africa's NDC target are already well embedded in domestic climate change policy, some of which have roots going back as far as the 2011 national climate change response white paper. Several of these instruments are already being tracked as part of South Africa's climate change M&E work. Therefore, this chapter does not focus on NDC tracking in isolation, but rather in the context of a broader examination of South Africa's mitigation M&E work, which is expected to continually evolve and improve over the course of NDC implementation.

5.1. Evolution and Current Status of Climate Change Monitoring and Evaluation

South Africa formally introduced the concept of a climate change M&E system in 2011 in the national climate change response white paper (Government of the Republic of South Africa 2011). While the term "M&E system" has never been defined in any government publication, it can be inferred to encompass all aspects of climate change M&E in South Africa i.e. data collection procedures, information flows, institutional arrangements, and web-based technology and systems. The initial aim of the M&E system, as set out in the 2011 national climate change response white paper, was to improve

understanding of the impact of mitigation measures implemented in the country (Government of the Republic of South Africa 2011).

After the concept was formally introduced in national policy in 2011, the Department of Environmental Affairs (DEA) worked on building and operationalizing the M&E system. By the end of 2014, DEA had revitalized the then-dormant national climate change response database and further developed the operational features of the M&E system. This included data collection procedures, and links with the GHG inventory system and the UNFCCC reporting process (DEA 2014). The government also introduced the idea of "feedback and learning," which involves review and iterations between the monitoring, evaluation, and outputs stages to ensure that the M&E system continues to meet the needs of the South African government and its stakeholders.

In 2015, DEA continued to deepen thinking on various aspects of the M&E system and published the "National Climate Change Response Monitoring and Evaluation System Framework" (DEA 2015). The framework document offered several useful details regarding the design of South Africa's M&E system, including M&E objectives, the overall system design, indicators, data collection processes, and institutional arrangements. The M&E system framework also expanded from mitigation tracking alone to the tracking of climate resilience and climate finance (although this thesis will not focus on resilience and finance since the scope is limited to mitigation tracking).

South Africa's M&E system has always developed with an eye on international reporting requirements. When the M&E system was first conceptualized in 2011, it was with a view of being "flexible and dynamic" and "evolving with international measuring, reporting, and verification requirements" (Government of the Republic of South Africa 2011). In addition, South Africa has been particularly responsive to developments in the international transparency regime. For example, South Africa published its first annual climate change report in 2016, which explicitly referenced the new international transparency regime and stated that these annual reports will "institutionalize and systematize South Africa's periodic reporting obligations under the UNFCCC, including the transparency requirements of the new Paris Agreement on NDCs" (DEA 2016). In the same vein, the Department of Environment, Forestry and Fisheries (DEFF) plans to integrate NDC tracking into South Africa's ongoing M&E work (Interview 1).

At the time of writing this thesis (May 2020), South Africa's climate change M&E work continues to evolve. The last document that was published by the government about the M&E system was in June 2019 (the third BUR) (DEA 2019b). The BUR includes a chapter on the M&E system, which describes the system as undergoing "refinement" between 2019 and 2020, focusing on four items: expanding integration, enhancing functionality, setting up a fully operational system, and improving domestic reporting (DEA 2019b). It is envisaged that the M&E system will be fully implemented in 2020 and, importantly, will continue to evolve in response to international and domestic needs.

5.2. Objectives of Tracking Progress Toward the Nationally Determined Contribution

South Africa has not yet set specific objectives for NDC tracking, but objectives can be inferred from stakeholder interviews and South Africa's broader M&E work.

NDC tracking in South Africa will likely support both international and domestic needs, just like the broader M&E work. As further background—there is a small disagreement among government officials interviewed that have worked or are currently working on M&E in South Africa about the primary driver of M&E vis-à-vis international reporting requirements and domestic needs. Of the four government/ ex-government stakeholders interviewed, one thought that the real impetus for M&E in South Africa is international compliance (Interview 3). On the other hand, three interviewees thought that M&E is driven primarily by domestic obligations, with roots in the 2011 national climate change response white paper, which necessitated the creation of an M&E system (Interviews 1, 2 and 4). The latter is a reasonable conclusion given that M&E in South Africa appears to have developed in a generally more sophisticated manner than what is required internationally. For example, publicly available documents show that the current M&E system design will include information flows and analysis from newly planned/adopted climate change policies such as the carbon tax, carbon budgets, and pollution prevention plans (DEA 2019b). This is well beyond current international tracking reporting requirements. Nonetheless, all government/ ex-government officials agree that M&E in South Africa is responsive to both international and domestic needs—the same of which can be inferred for NDC tracking. These ideas are explained further in sections 5.2.1 – 5.2.4.

5.2.1. Meeting International Obligations

South Africa will undertake NDC tracking to meet its international obligations under the Paris Agreement. This means that South Africa will report progress toward the NDC in biennial transparency reports (BTRs), the first of which to be submitted to the UNFCCC at the latest by 31 December 2024 (UNFCCC 2018). Historically, South Africa has been relatively responsive to international reporting requirements, in the sense of already submitting its third BUR to the UNFCCC in June 2019 (DEA 2019b). (Many other non-Annex I Parties are still developing either their first or second BURs.)

5.2.2. Meeting Domestic Needs – Deepening Understanding

South Africa has viewed its work on climate change M&E as a means to deepen understanding about its actions to address climate change i.e. to understand what works, what doesn't, and why (Government of the Republic of South Africa 2011; DEA 2014; DEA 2016; DEA 2017a; DEA 2019b). The same is likely to be true for NDC tracking, albeit with a narrower lens.[7] South Africa's DEFF conducts M&E to develop a knowledge base of the types of policies, actions, and measures that are successful, and to better understand the reasons behind their success. According to stakeholders interviewed for this thesis, M&E in South Africa also assists in making links between climate mitigation efforts and national social and

[7] Provided NDC tracking involves a deeper examination of policies and measures, not just emissions.

economic consequences, helping to situate climate change action within a broader context, beyond GHGs (Interviews 1, 3, 7, and 11).

5.2.3. Meeting Domestic Needs – Motivating Climate Action

The results of these tracking exercises can inform the design of new climate policies by providing accessible, understandable, relevant, and timely information and data. It is also a useful communication tool for motivating climate change action in South Africa, both with other government departments (outside environment) and external stakeholders. According to an official working on South Africa's M&E system, if you can communicate the results of climate change action, in a form that is tailored to a stakeholder's needs and their specific context, "mainstreaming becomes so much easier, because people understand what you are talking about and how to interpret low-carbon development in their context. It makes it easier to institutionalize, and for people to digest and appreciate…If you can't tell that narrative, then it is a problem." (Interview 3).

5.2.4. Meeting Domestic Needs – Promoting Transparency and Accountability

Finally, NDC tracking, as with M&E broadly, will promote transparency and accountability. It is a means of presenting the demonstrable impacts of interventions. It helps the government promote credibility and public confidence in its work. It also helps the government build trust that the climate change goals are achievable, and that the government is committed to achieving them.

5.3. The Enabling Environment

An enabling environment is essential to support effective NDC tracking. Section 4.2.2 identified several aspects of an enabling environment for NDC tracking: a well-defined government vision for climate change action, sufficient capacity and skills of team charged with undertaking M&E, and trust between government and data providers. The aspects are reviewed for South Africa in sections 5.3.1 – 5.3.3.

5.3.1. Government Vision

South Africa's vision for climate change action is articulated in the 2011 National Climate Change Response White Paper, which is to achieve an "effective climate change response and the long-term, just transition to a climate-resilient and lower-carbon economy and society" (Government of the Republic of South Africa 2011). South Africa's response to climate change has two main objectives: first, to "effectively manage inevitable climate change impacts through interventions that build and sustain South Africa's social, economic and environmental resilience and emergency response capacity," and second, to "make a fair contribution to the global effort to GHG concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe that enables economic, social and environmental development to proceed in a sustainable manner" (Government of the Republic of South Africa 2011).

In 2012, South Africa released a National Development Plan for 2030 titled "Our future – make it work" (Government of the Republic of South Africa 2012). The Plan's ultimate objective is to eliminate poverty

and reduce inequality. The Plan focuses on several themes, one of which being the environment—and the vision for which is very similar to that of the National Climate Change Response White Paper: "By 2030, South Africa's transition to an environmentally sustainable, climate-change resilient, low-carbon economy and just society will be well underway." This transition will be achieved through many actions, including coordinated planning, new investments, growth in renewable energy, increased consumer awareness, and policy and regulatory frameworks. The plan also introduces carbon pricing to promote investments in mitigation and adaptation activities.

In 2017, South Africa commenced work on a mid-century, low-GHG-emissions development strategy. A draft was published for stakeholder comment in December 2018, with the aim of submitting the final document to the UNFCCC by the end of 2020, in line with the invitation under the Paris Agreement (UNFCCC 2015, Article 4.19). The draft vision statement for 2050 is: "Putting South Africa on a low-carbon growth path while making a fair contribution to the global effort to limit the average temperature increase" (Government of the Republic of South Africa 2018a).

South Africa has also set GHG emission reduction targets for 2020, 2025, and 2030. Under the Copenhagen Pledge, set at the beginning of 2010, "South Africa will take nationally appropriate mitigation actions to enable a 34% deviation below the 'Business as Usual' emissions growth trajectory by 2020 and a 42% deviation below the 'Business As Usual' emissions growth trajectory by 2025" (DEA 2010). 'Business as Usual' is not defined in the pledge. Under the NDC, set in 2015, South Africa sets a goal for GHG emissions to be in a range of 398-614 $MtCO_2e$ between 2025 and 2030 (Government of the Republic of South Africa 2015). One interviewee noted that the large range of the GHG mitigation target in the NDC "makes it difficult to know exactly which direction emissions should head and to truly judge policy success" (Interview 5).

5.3.2. Capacity and Skills

Progress toward South Africa's NDC will be tracked by the M&E unit at DEFF. The success of this tracking will strongly depend on the capacity and skills of the team. Here, "capacity" is defined as the number of people devoted to a task, the political support for officials to conduct their work, and financial resources. Understandably, very little is published on the capacity and skills of DEFF M&E team, so interviewees were asked questions about staffing within the M&E unit.

On capacity, some interviewees agreed that the M&E team would benefit from more people (Interviews 1, 5, 6, 10). Staff numbers have always been a problem for DEFF (Interview 10) and the constant turnover of staff continues to be problematic, meaning there are long gaps in knowledge and understanding (Interview 5).

On skills, interviewees highlighted specific proficiencies that are essential to a well-functioning M&E team, including NDC tracking. From a technical standpoint, these skills include: a good general understanding of M&E (Interview 2); data skills (Interviews 4, 11); GHG inventory skills (Interviews 2, 4, 11); modelling skills, and the ability to undertake mitigation assessments and develop scenarios (Interview 2); a sound knowledge of South African business and industry (Interviews 5, 11); a good understanding of information technology (IT) systems (Interview 11); and a good understanding of

engineering and technology (Interview 2). A few interviewees also highlighted the need for "soft skills" such as being able to communicate effectively (Interviews 4, 11) and have some degree of political astuteness (Interview 11). An ex-government official also noted the need for fundraising skills, remarking: "managing and maintaining climate change M&E is not cheap!" (Interview 4).

Interviewees also noted specific gaps in the skills of South Africa's M&E team, which are related to the points highlighted above. For example, the development of the web-based system to help automate the M&E has also been largely outsourced, which has missed an opportunity to build skills inhouse (Interview 10). The M&E unit is missing people that are formally trained to conduct M&E (Interview 2). The unit lacks environmental economists and engineers (Interviews 2, 5). Staff lack training in social sciences, which helps to bring a broader perspective to the reasons why policies succeed or fail (Interview 3). The interviews did not describe further whether all these skills are required inhouse or whether it may be sufficient to commission or buy in skills for short period.

The M&E team has benefitted from international support to improve the skill-base of the M&E team, although high staff turnover persists, which negates some of these efforts (Interview 5). Additionally, the challenge with the support is that is generally provided on an *ad hoc* basis and to address a certain immediate gap—a gap which often remains after the work is complemented (Interview 1). The support often does not address the long-term needs of the M&E team (Interview 1). Nonetheless, Deutsche Gesellschaft für Internationale Zusammenarbeit (the German development agency) has been instrumental in providing institutional support, primarily centred on mitigation response work and the GHG inventory (Interview 1). The World Resources Institute provides capacity support and *ad hoc* training (Interviews 1, 3, 10). The M&E unit receives funding from the Global Environmental Facility (GEF) to support reporting and improve the GHG inventory and quality of data and emission factors (Interview 3). DEFF is currently participating in the GEF's Capacity-building Initiative for Transparency programme (Interview 3). The Norwegian government also supported the development of the web-based M&E system (Interview 4).

5.3.3. Trust

A key message emerging from the stakeholder interviews is about the lack of trust that exists between the DEFF and data providers for the M&E work, specifically the private sector. This may plague efforts to track the NDC, meaning it will be important to invest more time and effort in strengthening the relationship between DEFF and the private sector to promote transparency and build trust around data collection.

DEFF began collecting emissions data from companies on an *ad hoc* basis in the early 2010s. This data collection process was then formalized in April 2017 when the National GHG Emission Reporting Regulations came into effect (Government of the Republic of South Africa 2017a). The regulations make it legal requirement for companies that exceed certain thresholds[8] to report their emissions to DEFF on an annual basis (Government of the Republic of South Africa 2017a). The Pollution Preventions Plans subsequently came into effect in July 2017, which added an additional requirement for major emitting

[8] For example, by producing more than 10MW of energy per year or emitting more than 10,000 tCO_2e

companies to report on emissions projections and the impacts of mitigation projects (Government of the Republic of South Africa 2017b).

The rich new sources of data make it possible for DEFF to develop better GHG inventories, to make better GHG emissions forecasts, and to better understand the impacts of mitigation policies and measures. Of course, these expanded datasets present additional risks, for example, concerns from the private sector around the sensitivity of data and protection of confidential information, as well as additional reporting burdens. At the same time, companies appreciate that information sharing can lead to improved national policy direction. Indeed, many major emitters are supportive of improved data collection efforts and generally welcome mandatory reporting, if it is at the company-level rather than at the facility-level, and without risks of future penalty or regulation (Interviews 5, 6, 11).

To help understand the private sector's attitudes and concerns toward data collection, interviewees were asked questions about what companies are currently required to report, whether they have encountered any difficulties in providing this information to DEFF, and whether they felt there were still issues around the sensitivity of data or the protection of confidential information. Most interviewees felt that the reporting regulations and pollution prevention plans do adequately address concerns around confidentiality (Interviews 1, 2, 3, 4, 10, 11), since the data that is collected cannot be presented publicly in a disaggregated form (i.e. at the company level) (Interview 2). The issues around sensitive information also appears to be addressed largely by the regulations, although myths persist. For example, some entities think that they may face competition risks by releasing forward-looking production data (which is related to the disclosure of emissions projections). This is not a factual concern since the regulations adequately address this issue through the establishment of confidentiality agreements with companies and the data is not released publicly (Interviews 3, 5, 11). Companies also typically disclose this information already through their CDP reports and their annual reports (Interviews 8, 11), both of which are publicly released. So, it appears that these concerns are more to do with a lack of understanding (Interview 3), lack of trust with government (Interviews 8, 11), and/or concerns over increasingly stringent/ unnecessary reporting regulations (Interview 11).

South Africa's M&E system has evolved significantly since it was first conceptualized in the early 2010s—and indeed continues to evolve and improve. The next section evaluates whether NDC tracking in South Africa (which forms part of the broader M&E system) is effective.

5.4. Evaluating the Effectiveness of Tracking the Nationally Determined Contribution

Sections 5.1 – 5.3 helped to situate NDC tracking in South Africa, by providing context on the current status of M&E, the objectives for NDC tracking, and the enabling environment. This section now examines the effectiveness of NDC tracking in South Africa by evaluating, qualitatively, the extent to which the effectiveness criteria developed in Chapter 4 are met i.e. the application of logical framework matrix presented in section 4.3. The evaluation uses information collected from publicly available documents and the in-depth interviews.

In order to make sense of the findings and offer recommendations for improvement, the qualitative evaluation requires a measurement scale. In 1946, S. Stevens proposed a classification of scales of measurement, which is still used today. There are four scales of measurement—nominal, ordinal, interval, and ratio—each with a different focus and type of measurement. For this evaluation, an ordinal scale is most appropriate as it proposes an order/ranking of items. It helps evaluate the extent to which something is achieved. A nominal scale is not appropriate as this is an overly simplistic scale focused on categorization. Interval and ratio scales are also not suitable—or even possible in a qualitative evaluation—as these require statistical measures for scoring (Stevens 1946). Table 3 presents the ordinal measurement scale used for this evaluation.

Table 3: Summary of the Ordinal Scoring Scale for the Qualitative Evaluation of Effectiveness

Score	Necessary Conditions
—	Insufficient evidence to draw a conclusion.
○	Evidence suggests that the criterion is not met. This suggests a particular aspect is neglected.
◒	Evidence suggests that the criterion is partially met. This suggests that certain aspects are recognised as important; however, additional consideration may be required to make it truly effective.
◉	Evidence suggests that the criteria is fully met. This suggests that all aspects are effective.

The effectiveness criteria developed in Chapter 4 will now be qualitatively evaluated and scored for South Africa in sections 5.4.1 – 5.4.8. The score for each criterion will be shown first, followed by a detailed explanation. The summary of scores are presented in section 5.5.

5.4.1. Criterion 1: The indicators are simple and easy to understand, relevant to the desired outcome, and precise and measurable

Score: ◉

The strictly legal requirements for reporting progress toward NDCs are fairly minimal. All Parties can select their own indicator(s) for tracking progress, which "shall be relevant to a Party's NDC under Article 4 and may be either qualitative or quantitative" (UNFCCC 2018). Relevance is not defined in the COP decision. It is, however, worth noting that the general tenor of the MPGs reads "shall, as appropriate…" which means that should South Africa want to track progress to the best of its abilities (and not because it is legally required), they have facilitative guidance available to them (Winker, comments to author on thesis, February 20, 2019).

According to South Africa's M&E framework, the current indicators for tracking South Africa's transition toward a lower-carbon economy include: *sustainable carbon levels*, which encompasses GHG emission levels, changes in GHG emissions, mitigation impact of response measures; *lower carbon productivity*, which encompasses carbon intensity of the economy and energy intensity of the economy; *lower carbon consumption*, which encompasses per capita GHG emissions; *lower carbon resourcing*, which encompasses the proportion of renewables and carbon-free energy to total primary energy, and carbon

intensity of energy supply; and *lower carbon sector growth*, which encompasses growth in green jobs (DEA 2015).

While the higher-level indicators presented above (italicised) are not always readily understandable (for example, it is unclear what is meant by "sustainable carbon levels"), the underlying (non-italicised) indicators presented above are simple and easy to understand, are relevant for tracking mitigation action, and are quantifiable. South Africa has set a fixed level target in its NDC, which means that the most relevant indicator for tracking progress toward the NDC, in the strictest sense, is GHG emissions levels (also see Criterion 3 below). But South Africa may also use the same set of indicators presented above, particularly for tracking progress toward mitigation policies and actions. Therefore, evidence suggests that this criterion is fully met.

5.4.2. Criterion 2: Information collection is as simple as possible, but no simpler

Score: 

Information collected by South Africa's M&E unit is used to fulfil two main objectives: first, to calculate the GHG inventory and second, to calculate the mitigation impact of policies and measures, both of which are applicable to NDC tracking. For example, the GHG inventory, which includes estimation of emissions changes from the Agriculture, Forestry, and Other Land Use (AFOLU) sector, helps DEFF to compare current emissions with the NDC target; the mitigation impact of policies and measures enables DEFF to assess the likelihood of achieving the NDC target. Should South Africa trade Internationally Transferred Mitigation Outcomes (ITMOs) in future, these would also need to be quantified to track NDC progress accurately.

DEFF appears to be cognizant of keeping data collection to a minimum, in a manner that is still efficient and effective. For example, the national M&E framework document published in 2015 states that "climate change M&E will, to the greatest extent possible, rely on existing data collection and reporting systems," cautioning against reporting fatigue and duplication of effort (DEA 2015).

The main sources of data for the GHG inventory are from government departments,[9] which is also supplemented by annual emission reports from major emitting companies. The main sources of data for the calculation of the mitigation policies and measures are: government departments that are implementing major mitigation programmes, like the Department of Energy's Renewable Energy Independent Power Procurement Programme (REIPPP); municipalities implementing city-level mitigation projects like methane recovery from landfills and wastewater treatment plants; and the National Business Initiative, which is overseeing the Private Sector Energy Efficiency Programme (PSEE) (Interview 2). DEFF also collects project-level information from companies annually via the Pollution Prevention Plans (Government of the Republic of South Africa 2017b).

[9] The main government data providers are the Department of Energy, the Department of Mineral Resources, the Department of Water and Sanitation, and the Department of Agriculture, Fisheries and Forestry (DEA 2019b).

Based discussions with interviewees (Interview 2) and publicly available information, DEFF appears to only collect information that is strictly necessary to undertake robust M&E work. DEFF has also demonstrated awareness of reporting burdens.

DEFF does, however, encounter problems in collecting data. For example, South Africa's first annual climate change report published in 2016 states that "there is a dire need for key climate change response actors, including government departments (national, provincial and local), industry and NGOs to collect, measure and monitor primary output data on climate-related projects and programmes more effectively and systematically" (DEA 2016). This message is echoed by interviewees, with several government officials describing problems they are encountering, such as poor-quality data, information not being provided in the correct format, or entities not willing to share their data (Interview 3, Interview 4). According to one interviewee, problems with "data quality, access, timeliness, appropriateness, and consistency" are all issues that DEFF is currently dealing with (Interview 3). The lack of trust between government and the private sector is also problematic (also see section 5.3.3). Therefore, evidence suggests this criterion is partially met.

5.4.3. Criterion 3: There is legislative support for collecting data and protecting confidential information

Score: ◉

South Africa has established legal regulations to collect emissions data from companies (Government of the Republic of South Africa 2017a). The basis is South Africa's Air Quality Act of 2004, which put in place various measures for the prevention of pollution and standards for the regulation of air quality in the country. It authorizes the Minister of Environmental Affairs to enforce its provisions through the issuance of policy documents and regulations. In July 2017, the Minister defined six GHGs as "priority pollutants" under the Air Quality Act. This resulted in regulations that mandated companies that exceed emissions 0.1MtCO_2e annually to prepare and submit Pollution Prevention Plans to the Minister for approval (Government of the Republic of South Africa 2017b). These plans must contain a company-level GHG inventory and information about the impacts of planned and implemented mitigation projects (Government of the Republic of South Africa 2017b). The regulations also contain provisions for the protection of information, which states that "information obtained in terms of the regulations will be kept confidential" (Chapter 4 of the regulations, paragraph 7) (Government of the Republic of South Africa 2017b).

Since there is evidence of legislative support for both the collection and protection of information, this criterion is fully met. It is also worth noting that South Africa will likely soon adopt a Climate Change Bill, which will provide an additional legal basis for comprehensive climate action (Government of the Republic of South Africa 2018b). This includes updating the long-term national emissions trajectory, the allocation of sectoral emissions targets, and the regulation of large emitters including through carbon budgets (Presidency of South Africa 2019).

5.4.4. Criterion 4: The government can evaluate progress toward the NDC mitigation target by using outputs from the M&E work

Score: 

It is useful to regularly assess progress toward the NDC mitigation target over the implementation period in order to understand emissions trends, progress achieved to date, whether additional emissions reductions are needed to reach the target, and the likelihood of achieving the target (Levin et al. 2014).

In the strictest sense, progress toward the NDC is assessed by comparing current emissions levels against target level of emissions. Since South Africa has an absolute-level target (i.e. a fixed emissions range), this comparison is relatively straightforward. South Africa can compare its most recent GHG inventory against the target level range of 398-614 $MtCO_2e$. During the period of implementation, the outcome is whether South Africa is on track to meet its NDC mitigation target. For example, the outcome could be reported as "appears to be on track," because halfway through the implementation period, South Africa has reduced emissions by more than 50 percent of what is necessary to meet the target. A structured summary, as called for by the MPGs, will be helpful for reporting in this regard (UNFCCC 2018). Only at the end of the target period (i.e. after 2030), can it be truly judged whether the country has actually met its target. Since progress toward the NDC mitigation target is assessed using only the GHG inventory, which is already produced by the M&E system, this criterion is fully met.

5.4.5. Criterion 5: Transparency is enhanced when using outputs from the M&E work

Score: 

From an international standpoint, transparency has long been a focus of the climate change negotiations, with Parties operating under the premise that higher levels of trust can be achieved if more information is shared. The information is intended promote confidence that global climate change goals are achievable, and all Parties are committed to reaching them. Indeed, all Parties are obliged to communicate information relevant to the implementation of the Convention, including information on GHG emissions and actions taken to reduce these emissions (among other matters) (UNFCCC 1992; Article 12). South Africa currently complies with the transparency/ reporting requirements of the UNFCCC through the submission of national inventory reports and biennial update reports, as well as participation in the technical analysis and facilitative sharing of views. This historical evidence suggests that South Africa meets this criterion from an international perspective, assuming it continues to submit biennial transparency reports (BTRs) and participates in the facilitative, multilateral consideration of progress (FMCP) after 2024.

From a domestic standpoint, to enhance transparency, outputs should provide stakeholders with a clearer sense of the status of policies and actions implemented to address climate change (Kusek and Rist 2004), which promotes public confidence in the government's work. Evidence suggests that this criterion is also fully met, since DEFF produces several additional reports, above what is required internationally. These include annual climate change reports (DEA 2016; DEA 2017b) and a policy

evaluation tracking tool (under development), which is a web-based platform that presents South Africa's GHG emissions levels and the impacts of major policies and measures (Interview 1).

5.4.6. Criterion 6: All actors can understand the links between climate mitigation efforts and national social and economic consequences when reviewing the outputs from the M&E work

Score: 

From a mitigation perspective, the outputs of South Africa's M&E work include the GHG inventory and the impacts of mitigation actions. South Africa has also designed its M&E system to produce information on "wider impacts" of mitigation actions, which the third BUR explains as follows: "The structure of the M&E system for mitigation-action indicators enables key experts to reference literature and project documents that highlight the wider impacts of mitigation actions and identify suitable metrics. By selecting an appropriate unit of quantification, for example the number of jobs generated by the solar energy system installation, it is possible to estimate a baseline value, a target ex-ante value aligned with national strategic areas, and ex-post analyses that track the progress towards achievement of the target" (DEA 2019b). This information is intended to provide a broader narrative surrounding mitigation actions in South Africa (DEA 2019b).

South Africa is clearly demonstrating an intent to communicate information on the linkages between climate mitigation efforts and national social and economic consequences—but this is not yet occurring in all cases. South Africa's latest biennial update report includes the GHG emissions impacts of many mitigation actions but does not provide information on costs of these actions or impacts on jobs, apart from the occasional vague reference to general "job creation." Moreover, South Africa states that it tracks "cost effectiveness" and "job creation effectiveness" of its mitigation actions as part of the M&E work (DEA 2015) but is still yet to publish any information related to these indicators. It does, however, appear that this information is available. For example, South Africa's Department of Planning, Monitoring, and Evaluation (DPME) has examined and published documents the socio-economic impacts of two new major pieces of South Africa's climate change response—the Climate Change Bill (DPME 2017a) and the carbon tax (DPME 2017b). Therefore, this criterion in partially met, because evidence suggests that information relating to the socio-economic impacts of climate mitigation is available, but not communicated through international biennial update reports or domestic annual climate change reports.

5.4.7. Criterion 7: On track to achieve the NDC or, as a proxy, on track to achieve the Copenhagen pledge

Score: 

In the NDC submitted under the Paris Agreement, South Africa formally committed to achieving GHG emissions levels in the range of 398 to 614 $MtCO_2e$ between 2025 and 2030. The achievement of this target can only be truly judged *ex-post* i.e. at the end of the target period in 2030.

Nevertheless, projections with credible assumptions can help to determine whether South Africa may meet this target based on current policies, or whether additional mitigation interventions are needed.[10]

A recent study has examined the impact of policies and measures on South Africa's GHG emissions (EScience Associates and Energy Research Centre 2018). This study concludes that South Africa is on track to meet the NDC target with current policies (i.e. the projections fall in between the large emissions range of 398 to 614 $MtCO_2e$ between 2025 and 2030). Their "reference scenario," which includes all policies and measures implemented before 2016, shows emissions peaking at 515 $MtCO_2e$ in 2025 and declining to slightly under 500 $MtCO_2e$ in 2030. Therefore, it appears that South Africa may be on track to achieve its NDC. The study importantly notes that this reference scenario is a significant departure from previous reference scenario projections. This departure is primality due to: (1) rapidly falling renewable energy costs; (2) declining liquid fuels demand as a result of energy efficiency improvements, and modal and technology shifts in the transport sector; (3) more moderate economic growth; and (4) advances in the assessment of South Africa's terrestrial carbon sinks.

Regarding South Africa's Copenhagen pledge, which calls for a 34 percent emission reduction below business as usual levels by 2020 (DEA 2010), South Africa appears to be on track to reach this goal as well. While not communicated internationally, DEA did publish numbers associated with the "Peak, Plateau, and Decline" emissions trajectory, on which the Copenhagen Pledge is based. The target emissions level in 2020 is 583 $MtCO_2e$.[11] South Africa's emissions, including Forestry and Other Land Use (FOLU) were 512 $MtCO_2e$ in 2015 (DEA 2019b) and 426 $MtCO_2e$ in 2000. Assuming emissions continue to rise at the same rate between 2015 and 2020, South Africa's emissions in 2020 would be lower than the Copenhagen pledge (possibly around 541 $MtCO_2e$). Therefore, evidence suggests that this criterion is fully met.

5.4.8. Criterion 8: NDC tracking is iterative (performance oriented) and supports continual learning and improvement

Score: 

To be considered effective, the outputs from the M&E work (including NDC tracking) should provide useful information to inform decision- and policymaking. This means that there should be a clear link between the outputs that are produced and changes in policy direction. For example, if certain mitigation policies and actions are not delivering the expected results, there will be course corrections along the way to address any challenges or barriers. Similarly, if certain policies are producing excellent outcomes, this learning will be capitalized upon and employed in other areas.

[10] It should be noted that this is, however, not a suitable approach for reporting to the UNFCCC. The MPGs are clear that "projections are indicative of the impact of mitigation policies and measures on future trends in GHG emissions and removals, and shall not be used to assess progress towards the implementation and achievement of a Party's NDC under Article 4 of the Paris Agreement…" (UNFCCC 2018, para. 93).

[11] While DEA has removed the "Peak, Plateau and Decline" trajectory graphic from its website, it is still available for searching online.

The idea of feedback, learning, and iteration has been built into South Africa's M&E work from the very beginning. Indeed, the function of "evaluation" in M&E is to provide continuous assessment on the monitoring function, and to promote learning, improvement, and knowledge-sharing through the results and lessons learned (DEA 2014). While it is clear that South Africa intends to use the outputs form M&E work to inform policy direction, there is no published evidence to suggest that this is happening. For example, the government has not included any mention of changes to climate change policy that resulted from M&E work in any official document published since 2011. One government official that is currently working on M&E in South Africa suggests that the reason there aren't better links between outputs and policy change is because the current outputs do not provide enough information on the "how" and the "why" mitigation actions succeed or fail (Interview 3). In the rush to quantify emissions and impacts of measures, DEFF appears to be missing a key step in assessing the theory of change (Interview 3). Therefore, evidence suggests that this criterion is partially met.

5.5. Summary of Scores

The evaluation shows that South Africa is already fully meeting criteria in several areas of NDC tracking. The government has established a well-defined vision for climate action, including setting an absolute-level mitigation target in its NDC, which makes tracking progress toward this target much easier. The mitigation indicators are easy to understand and relevant to NDC tracking. There also legislative support for the collection and protection of information. Moreover, evidence suggests that the outputs produced from South Africa's M&E work do enhance transparency and will allow the government to evaluate progress toward the NDC target. South Africa also appears to be on track toward achieving its Copenhagen pledge. The evaluation has also revealed items to improve, which will be assessed in greater detail in Chapter 6. A summary of the evaluation is presented in Table 4.

Table 4: Effectiveness of NDC Tracking in South Africa

Element	Indicator of effectiveness	Score
Inputs	Criterion 1: The indicators are simple and easy to understand, relevant to the desired outcome, and precise and measurable	●
Processes	Criterion 2: Information collection is as simple as possible, but no simpler	◒
	Criterion 3: There is legislative support for collecting data and protecting confidential information	●
Outputs	Criterion 4: The government can evaluate progress toward the NDC mitigation target by using outputs from the M&E work	●
	Criterion 5: Transparency is enhanced when using outputs from the M&E work	●
	Criterion 6: All actors can understand the links between climate mitigation efforts and national social and economic consequences when reviewing the outputs from the M&E work	◒
Outcomes	Criterion 7: On track to achieve the NDC or, as a proxy, on track to achieve the Copenhagen pledge	●
Performance management	Criterion 8: NDC tracking is iterative (performance oriented) and supports continual learning and improvement	◒

5.6. Limitations

The evaluation of the effectiveness of NDC tracking in South Africa has produced some good insights, including opportunities for strengthening action in certain areas; however, this study is subject to certain limitations.

First, the evaluation uses only publicly available information and responses from a fairly small number of in-depth interviews (eleven interviews total). More work and thinking on NDCs may be underway at DEFF, which is behind-the-scenes and not reflected in publicly available documents.

Second, this evaluation is mostly qualitative (apart from criterion 7), which comes with benefits and limitations. On benefits, the qualitative evaluation has provided an opportunity to explore NDC tracking holistically and go deeper in certain areas, which a quantitative assessment may not have supported. The qualitative evaluation has allowed for the exploration of the reasons why certain criterion are met (or not), rather than just yes/no responses. This helps to provide the foundation for recommendations to enhance certain aspects of NDC tracking in South Africa (see Chapter 6). The qualitative approach does, however, limit the ability to provide definitive answers and leaves room for some interpretation.

The thesis now turns to an examination of the opportunities to improve NDC tracking in South Africa.

6. Enhancing Arrangements for Effective Tracking of South Africa's Nationally Determined Contribution

Chapter 5 highlighted some elements that can be improved upon to make NDC tracking in South Africa more effective. Based on this evaluation, there are four areas to enhance arrangements for effective NDC tracking: (1) enhance the capacity and skills of DEFF's M&E unit (see section 5.3.2); (2) improve information collection (as criterion 2 is only partially met); (3) demonstrate ties between climate mitigation efforts and positive socio-economic outcomes (as criterion 6 is only partially met); and (4) make NDC tracking iterative to support stronger links between the outputs of the NDC tracking work and changes in national policy (as criterion 8 is only partially met).

This chapter offers recommendations for improving each of these elements. The recommendations are based on academic literature, content analysis of key documents and findings from the in-depth interviews. In keeping with the previous chapters, NDC tracking is not examined in isolation but rather treated as a component of South Africa's broader response to climate change.

6.1. Enhancing the Capacity and Skills of the Monitoring and Evaluation Unit

Section 5.3.2 provided significant detail on the capacity and skill gaps within DEFF's M&E Unit. Once again, "capacity" is defined as the number of people devoted to a task, the political support for officials to conduct their work, and financial resources available (the latter two are intrinsically linked). Skills go beyond GHG inventory compilations and include both technical skills as well as "softer skills" like political astuteness and ability to fundraise. While external support has played an important role in bridging certain capacity gaps (Interviews 1, 2, 3, 10), it is an unsustainable long-term solution (Interview 1).

Accordingly, two recommendations are offered to enhance the capacity and skills of DEFF's M&E unit:

The first recommendation is to develop a medium-term, internal strategy for climate change M&E work at DEFF (as interpreted from Interview 1), including specific goals that the M&E unit would like to achieve over the next 5 years. Granted this will only be successful if financial resources are made available to implement the strategy. The strategy could apply results-based management with a logical framework approach, as described in Chapter 5. This means there would be a strong focus on performance in the strategy, with inputs feeding into processes that deliver outputs leading to outcomes—the latter which is clearly linked to South Africa's development agenda. Processes would link with the international climate landscape and UNFCCC negotiations. Inputs would be clear and specific and include associated costs and skillsets. Local organisations could be employed to support discrete pieces of work in support of the internal strategy if there are internal gaps. A key message emerging from the stakeholder interviews is that there is a significant skillset within South Africa that could support DEFF in M&E work, including tracking progress toward the NDC. This includes government

organisations (Stats SA, CSIR, SAEON),[12] research centres, universities, and private organisations and consultancies (The Green House, DNA Economics, ERM, Southern Hemisphere, Promethium Carbon) (Interviews 3, 6, 8).

The second recommendation is to enhance the capacity and skills of the M&E unit with a specific focus on tracking goal progress (see section 5.3.2). This capacity goes beyond GHG inventory compilation, which is already fairly well established in South Africa (Interviews 1, 4, 9, 10). Winkler et al. (2019) suggest several elements of a well-functioning institution that would allow for effective NDC tracking: skilled officials that can report information in a transparent, accurate, complete, consistent and comparable manner (i.e. the "TACCC principles"), as well as skilled officials that can coordinate with data providers from relevant government departments and companies (and the data providers themselves requiring tracking and reporting skills). A statutory body could be feasibly established under South Africa's proposed Climate Change Bill to support this coordination (Winkler et al. 2019). Indeed, in a separate vein, a Presidential Climate Change Coordinating Commission will be established to oversee South Africa's just transition work (Government of the Republic of South Africa 2018c).

6.2. Improving Information Collection and Reporting

As noted in sections 5.3.3 and 5.4.2, DEFF encounters problems in collecting data. The data is often not easily collected or willingly provided, data is often not provided in the correct format, and data quality remains a challenge. These limit DEFF's ability to conduct robust M&E, which has a knock-on effect on other aspects of the department's climate change work

DEFF has improved data quality and collection in recent years, largely through the introduction of the National GHG Emission Reporting Regulations and Pollution Prevention Plans in 2017 (Government of the Republic of South Africa 2017a; Government of the Republic of South Africa 2017b). The amendment to the National GHG Emission Reporting Regulations proposed in September 2019 (DEA 2019a) is also likely to result in positive changes. Among other matters, the amendment calls for GHG emissions reporting at both the data provider level and at facility level, which will improve the granularity of data collected. The amendment requires more complete reporting, covering all process, fugitive, and combustion emissions. The amendment may also improve data quality, as it allows data providers an opportunity to request a review of the applicable emission factor(s) and to transition to better calculation methodologies over time. The carbon tax introduced in June 2019 provides additional impetus for better company-level reporting, providing a five percent carbon budget allowance for data providers that comply with reporting requirements (Government of the Republic of South Africa 2019).

It is within this context that the following recommendations are offered to improve DEFF's data collection and reporting efforts:

[12] It would be remiss to not reflect on the current issues associated with receiving support from other government organisations for M&E work. As one interviewee noted, "the biggest challenge we [DEFF] are facing is the funding models of some of the institutions from which we received support…for example, the CSIR must make a profit, which might not be compatible with a public goods service" (Interview 1).

The first recommendation is to strive to make data collection processes more streamlined. While information collection is as simple as possible (and no simpler), the research pointed to improvements in collecting data more effectively and systematically (see section 5.4.2). The future facility-level reporting should assist with collecting information from heavy-emitting industry. Long-standing Memorandums of Understanding (MoUs) with key government departments, like the Department of Mineral Resources (DMR) and Department of Energy (DoE), can help provide a legal backbone for information solicitation requests (Interview 2). DEFF too often needs to rely on "humble requests" (Interview 2), "knocking on doors" (Interview 3), and existing personal relationships with colleagues in other government departments (Interview 1) in order to collect data.

The second (and related) recommendation is to speed up the transition toward an online and automatic information collection system. DEFF currently relies heavily on manual and legacy information systems, which is time-consuming and can contribute to poor data quality (Interview 4). While the eventual idea is to have an online portal to capture reporting submissions from companies, this has not yet materialised (Interview 8).

The third recommendation is to provide training on the information and reporting requirements for the M&E system. The in-depth interviews revealed that large organizations have capacity and experience in reporting GHG emissions and mitigation potential data. Indeed, these organizations have been reporting on climate change issues for many years via annual reports, the CDP, and to government. But smaller organizations have less experience and less capacity (Interviews 1, 3, 5, 6, 8, 11). The same is true for municipalities (Interviews 5, 6). These groups should be focused on for future training. At the same time, learning must also occur within DEFF as it implements the M&E system (Interview 3).

The fourth recommendation is to begin to practice implementing the NDC tracking requirements called for under the MPGs (UNFCCC 2018, Chapter III.C). This includes progress toward targets, which are tracked using "relevant" indicators (paragraph 65) and reported in the form of a "structured summary" (paragraph 77), as well as progress toward mitigation policies and measures (paragraph 80), which are reported in a tabular format (paragraph 82). The structured summary is a key tool for tracking progress, although the quality of information depends on underlying methodologies (Winkler at al. 2019). The MPGs also request the Subsidiary Body for Scientific and Technological Advice (SBSTA) to develop "common tabular formats" (CTFs) for the reporting of information on tracking progress (among others), including the structured summary, to be adopted by COP26 in 2020 (UNFCCC 2018, paragraph 12(a)). Researchers have offered suggestions on what the CTFs may look like in preparation for this meeting (for example, see Winkler et al. 2019; Rocha and Ellis 2020).

The final recommendation is to work on building trust and relations between the government and private sector, which is currently quite poor (see section 5.3.3). Studies have shown that if entities are transparent about their reasons for collecting data, and offer fair value[13] in return for it, they will be trusted and will earn ongoing and even expanded access (Morey et al. 2015). Accordingly, DEFF may wish to invest in communications efforts that are targeted at explaining the purposes of data collection

[13] "Value" here is not intended in the monetary sense.

and how it is used. Here it will be also important to underscore that information is collected only as strictly necessary.

6.3. Demonstrating Ties Between Climate Mitigation and Positive Socio-economic Outcomes

South Africa's current response to climate change framed through a development/socio-economic lens. The 2011 national climate change response white paper, for example, outlines a vision for climate change action that "enables economic, social and environmental development to proceed in a sustainable manner" (Government of the Republic of South Africa 2011). The strategic approach is one that "prioritises climate change responses that have both significant mitigation and adaptation benefits, and that also have significant economic growth, job creation, public health, risk management and poverty alleviation benefits" (Government of the Republic of South Africa 2011). The metrics that have been selected for measuring progress toward South Africa's climate change goals include "cost-effectiveness" and "job-creation-effectiveness" (DEA 2015).

While it is clear that South Africa's prioritises climate actions that deliver positive socio-economic outcomes, section 5.4.6 revealed the DEFF is not yet effectively communicating information about climate mitigation and development linkages.

There is increasing understanding globally that an ambitious response to climate change can result in significant benefits. According to the New Climate Economy's 2018 report, transitioning a low-carbon, sustainable growth path could deliver a direct economic gain of US$26 trillion globally through to 2030 compared to business-as-usual, while also generating over 65 million new low-carbon jobs (New Climate Economy 2018). The is also growing consensus that the health benefits of climate actions outweigh the costs of mitigation action. A recent study concluded that limiting warming to 1.5-2°C could save over one million lives a year from air pollution alone by 2050 (Markandya et al. 2018). The same analysis also showed that the value of the health gains could be approximately twice the cost of the mitigation policies. These results have been echoed in recent modelling work undertaken by countries and regions. For example, the European Commission's long-term climate strategy, called "A Clean Planet for All," showed that meeting the European Union's goals for emissions neutrality will require significant additional investment, particularly for energy and related infrastructure, but that the benefits that accrue from preventing premature air pollution-related deaths will exceed the costs (European Commission 2018).

From a domestic standpoint, several recent studies have assessed the impact of a low carbon transition in South Africa, which can help to guide future policies:

The first study examined the socio-economic impacts of existing and proposed mitigation policies and measures (EScience Associates and Energy Research Centre 2018). The overall message emerging from this study is there will be positive impacts on employment and Gross Domestic Product (GDP) in South Africa when planned key mitigation policies are implemented in combination. Moreover, the implementation of additional policies and measures can create even better long-term benefits, despite

shorter-term negative impacts on GDP due to increasing in electricity sector investment as the sector rapidly transitions toward a renewable energy supply.

A second study assessed the risks to South Africa's economy as a result of the global economic transition to a low-emissions society (Huxman et al. 2019). A key conclusion from this study is that South Africa faces a significant financial risk due to its heavy economic reliance on coal, but there are measures to mitigate this risk, and indeed, ways to find opportunities to capitalize on this transition. This includes through new markets for minerals used in low-carbon technologies (for example, platinum and manganese) or through the creation of new jobs in industries that are more resilient to, or would even benefit in, a low-emissions economy.

South Africa's Department of Planning, Monitoring, and Evaluation (DPME) has also examined the socio-economic impacts of two new major pieces of South Africa's climate change response—the Climate Change Bill (DPME 2017a) and the carbon tax (DPME 2017b). The DPME investigated several different areas as part of this work, including the groups that will benefit from these new legislations, those that will bear the costs, and means of managing perceived risks. Regarding the Climate Change Bill, the exploratory work of the DPME found that this legislation would benefit the poorest and most vulnerable, it would foster social cohesion, enhance security (safety, financial, food, energy), improve inequality, support job creation, and support environmental sustainability. The only downside is that GDP may be negatively impacted in the short-term as heavy-emitting industries bear the financial impacts of climate action, but these impacts are expected to be marginal as the benefits of the transitioning to a low-emissions society far outweigh the costs over the long run. The DPME's work on the assessing the Climate Change Bill also notes that the government and stakeholders will benefit from "ongoing research into the economic and social costs and benefits of implementing the adaptation and mitigation measures proposed in the Bill, as the instruments evolve and are implemented and revised over time." Regarding the carbon tax, the DPME reaches similar conclusions. There will generally be an improvement in socio-economic factors as a result of implementing the carbon tax, and the marginal impact on GDP can be mitigated through a gradual phase-in of the tax coupled with revenue recycling. The DPME also underscores the key role of M&E in the implementation of the carbon tax, which can help set sector benchmarks, quantify mitigation potentials, and identify areas for additional research.

In sum, it is clear that the DPME and outside researchers are already identifying and quantifying the positive development benefits associated with climate mitigation, yet these benefits are not yet being described as part of South Africa's formal climate change reporting —either internationally in BURs, or domestically in annual climate change reports. The key recommendation is therefore for DEFF to begin reporting on the links between climate mitigation and positive socio-economic outcomes, underscoring the importance that South Africa places on these types of analyses.

6.4. Making Tracking Iterative and Performance-Oriented

Section 5.4.8 revealed that there is no evidence to suggest that the outputs of South Africa's M&E work inform policy direction/changes, despite good intent that this will happen. Nonetheless, based on the findings from Chapter 5, there is one specific recommendation that emerges that could help make

tracking iterative and performance oriented—and this relates to improving the mitigation target in South Africa's NDC.

As described in section 5.4.7, an external study commissioned by DEFF in 2018 concluded that South Africa is on track to meet its NDC mitigation target with current policies (EScience Associates and Energy Research Centre 2018). Moreover, the implementation of additional mitigation policies will result in positive development benefits for the country. This external study should therefore inform the revised NDC that South Africa submits to the UNFCCC in 2020, in accordance with the framework developed in this thesis. Recall that in order to be effective, the outputs of the M&E work should inform NDC planning, so that there is continual learning and improvement.

South Africa's President has already signalled that this work is underway. In September 2019, in a statement to the United Nations' Secretary General, South Africa's President Cyril Ramaphosa committed to enhancing the current mitigation contribution of South Africa's NDC before the end of 2020. According to the statement, this will be achieved by decommissioning old coal powered plants, adding renewable energy capacity, and minimizing the environmental impact of mining (in addition to the implementation of current mitigation policies and actions). The statement also goes on to note that "additional mitigation ambition by 2030 will require a bold programme which targets our key emissions source, the electricity sector, and goes beyond current plans to invest further in renewable energy" (Presidency of South Africa 2019).

6.5. Summary

This chapter has provided recommendations for enhancing DEFF's ability to effectively track progress toward the NDC in four areas. First, DEFF can enhance the capacity and skills of the M&E unit by developing a medium-term, internal strategy for climate change M&E work, and supporting skills development with a specific focus on goal tracking. Second, DEFF can improve information collection and reporting by making data collection processes more streamlined, speeding up the transition toward an online and automatic information collection system, practicing implementing the international NDC tracking rules, and building trust with the private sector. Third, DEFF can begin reporting on the links between climate mitigation and positive socio-economic outcomes, underscoring the importance of these links and related analyses. Finally, DEFF can help to make NDC tracking more performance-oriented through one specific action in 2020—and that is improving the mitigation target of South Africa's NDC.

While not explored in this chapter (as it does not stem directly from the analysis in Chapter 5), it is worth noting that DEFF is one of smaller, less influential departments within the South African government (Rennkamp and Marquard 2018). The success of NDC tracking and related improvement efforts will also therefore depend on support from other government departments.

The thesis now turns to an application of the NDC tracking framework on other developing countries.

7. Applying the Framework to Other Countries

This chapter applies the tracking framework developed in Chapter 4—specifically, the logical framework matrix presented in section 4.3—to developing countries other than South Africa. Since NDC tracking is new, there is limited information about how well countries are prepared to track progress toward their 2025/2030 commitments. Structured methods for evaluation (like the framework developed in this thesis), will be essential if NDC tracking is to develop into an effective system that improves policy responses to climate change. Thus, it is useful to critically evaluate the content and quality of countries' current reporting on progress toward mitigation goals, to deepen the analysis of this thesis. This is also a means of determining whether the framework is broadly applicable to other countries *as is*, or if corrections are required.

7.1. Examining Biennial Update Reports

Internationally, there has been increasing responsibility on developing countries to report on their progress toward addressing climate change. As described in section 2.2.2, in 2007, reporting requirements were significantly expanded through the Bali Action Plan, with agreement that developing countries (non-Annex I countries) were to submit biennial update reports (BURs) (UNFCCC 2007). One of the key objectives for the preparation of BURs was to increase the transparency of mitigation actions and their effects, and support needed and received.

Since BURs are currently the primary vehicle for countries to report internationally on progress toward mitigation goals, they make for a good information base on which to apply the NDC tracking framework. BURs are also structured according to a pre-defined format, so they provide a common base to undertake content and comparative analysis across several developing countries. Additionally, BURs will transition to BTRs by 2024, which will become the primary vehicle for reporting on progress toward the implementation and achievement of NDCs.

While the body of formal reporting documents from developing countries has grown exponentially in recent years, the submission of BURs has been uneven. All developing countries were invited to communicate their first BURs by the end of 2014, and every two years thereafter, but as of May 2020, only 56 (out of 156) non-Annex 1 countries had communicated a first BUR. Moreover, only 31 developing countries have communicated a second BUR, and only 10 countries have communicated a third BUR—Andorra, Argentina, Brazil, Chile, Lebanon, Namibia, the Republic of Korea, Singapore, South Africa, and Uruguay (UNFCCC 2020a).

It was decided to only apply the framework to countries that have communicated a third BUR, as South Africa has done. Countries' reporting typically improves over time, and there is also a larger information base to draw from (i.e. three reports, as opposed to one or two). It would have been difficult to apply the framework to countries that are laggards in reporting, as there would be insufficient information to review, and thus the application would not be as robust. Countries that did not submit their BURs in English were also excluded for this analysis (Andorra, Argentina, and Uruguay). For these reasons, this

chapter analyses six non-Annex 1 countries: Brazil, Chile, Lebanon, Namibia, the Republic of Korea, and Singapore.

7.2. Content and Comparative Analysis

Content analysis of BUR1, BUR2, and BUR3 from each of the six countries was done to determine the preparedness of national governments for effective NDC tracking and reporting. The approach followed was similar to that in section 5.4—the content from all countries BURs were evaluated, qualitatively on an ordinal scale, on the extent to which the indicators developed in section 4.3 are met i.e. the application of the logical framework matrix (see Table 3). The only difference here is a smaller information base. Only BURs are evaluated in this chapter, whereas the South African case in Chapter 5 drew on information from additional documents and eleven in-depth interviews.

The systematic evaluation of these BURs helps to understand how six developing countries are equipped for future NDC tracking and reporting, and how they compare with each other. Table 5 presents the analysis. The progress across the six countries is markedly uneven, and no country is yet fully meeting more than five of the eight effectiveness criteria, as explained further in sections 7.2.1 and 7.2.2.

7.2.1. Comparison Across Criteria for Each Country

The rows in Table 5 present the effectiveness criteria developed in section 4.3. The scores for enhancing transparency were the highest for all countries (Criterion 5), followed by the ability to track progress from the outputs of the M&E work (Criterion 4). The use of indicators (Criterion 1), the way in which information is collected (Criterion 2), and the production of useful information (Criterion 6) were among the poorest scoring. Only two countries could clearly demonstrate that mitigation goal tracking is performance oriented (Criterion 8). None of the BURs provided comprehensive reporting of all criteria. For example, none of the six countries' BURs describes the type of information countries are collecting for tracking progress toward mitigation goals, with countries either choosing not to report this or specifically stating they do not have enough information to assess goal progress. Three of the six countries (Namibia, the Republic of Korea, and Singapore) did not report on the indicators they use to track progress toward mitigation goals.

7.2.2. Comparison Across Countries

The columns in Table 5 present the summary of the evaluation for each country. Brazil is the highest scoring country of those assessed (scoring 4.5 out of 8). The government can evaluate progress toward the NDC mitigation target by using outputs from the M&E work (Criterion 4), transparency is enhanced when using outputs from the M&E work (Criterion 5), all actors can understand the links between climate mitigation efforts and national social and economic consequences when reviewing the outputs from the M&E work (Criterion 6), and the country appears to be on track to achieve the Copenhagen pledge (Criterion 7). Brazil also selects relevant indicators for tracking work, despite some redundancy. The second highest scoring countries are the Republic of Korea and Singapore (scoring 4 out of 8). Both countries meet criteria 3, 4, 5, and 8. They score differently to Brazil, in that both countries have a strong legal basis for collecting information (Criterion 3) and demonstrated intent to improve their M&E

system over time (Criterion 8). Namibia, Chile, and Lebanon are the poorest scoring countries (scoring less than 2 out of 8). Apart from enhancing transparency through successive communications of BURs, very few other criteria are met.

7.2.3. Opportunities for Improvement

This analysis has revealed that there are currently several deficiencies in effective mitigation goal tracking among six countries that have reported more often than others. Countries citied various barriers to mitigation goal tracking, which include poor information flows between entities responsible for mitigation actions and the government, a general lack of data, an under-established MRV system, a lack of clear legal/government mandate, and an absence of methodologies to quantify the impact of mitigation policies and actions.

This finding implies a challenge for other developing countries' abilities to effectively track NDCs in future. The most obvious limitation is resources, as well as human and institutional capacity. All countries describe financial and capacity needs for strengthening their MRV systems. For example, Chile states that limited financial resources make it difficult to establish a sustainable system for reporting; Namibia requests further technical assistance to assess the impacts of mitigation actions. Despite this, all countries demonstrate a commitment to improving their MRV systems over time—and indeed are already doing so, as evident from the progression of reporting in first BURs to third BURs. Most developing countries will require ongoing funding to achieve this objective, allowing them to enhance their information base and effectively implement mitigation policies and actions.

A second deficiency is procedural. Based on the hypothesis of this thesis, in order to be effective, NDC tracking should be performance-oriented, produce a broader dataset to inform decision-making (i.e. more than just a GHG inventory), and show the links between mitigation actions and socio-economic impacts. The results of this analysis show that, apart from Brazil, very few countries are currently meeting these criteria (granted, formal MRV guidelines do not require this information).

7.3. Summary

The assessment in this chapter broadened the learning about the application of the framework beyond one case study, to six other developing countries. The results of this chapter demonstrate that it is possible to apply the framework to six other developing countries, which shows that the framework is broadly applicable. The criteria are universal, although some countries may wish to weigh certain criteria higher than others. For example, strengthened linkages between climate and development policies may be a major priority for one country, but less so for another. While criteria weighing was not done in this analysis, there are recognised benefits of doing so.

The results of the application show that countries will likely require additional resources and capacity in order to track NDCs effectively in future—even those countries that are already fairly advanced with regard to their international climate change reporting. But these results are subject to certain limitations. First, the extent to which countries are reporting on progress toward current mitigation goals is used as a proxy measure of how well they might be equipped for effective NDC tracking. Second,

the assessment relies on a qualitative scoring methodology, so a certain level of subjectivity is unavoidable. Finally, BURs were the only source of information reviewed and countries may indeed be progressing further than what is reported in these documents. BURs also may be written for international compliance only, rather than to demonstrate the most effective tracking system possible. For example, many of the effectiveness criteria in this framework are not required to be reported on in international reports, per current relevant MRV guidelines. This is quite an important limitation of this analysis. The assessment of South Africa in Chapter 5 shows the country performing much better against the effectiveness criteria (scoring 6 out of 8), but this may be because there was a larger pool of information to draw from.

This thesis now turns to the overall conclusion.

Table 5: Effectiveness of NDC Tracking in Six Other Developing Countries

	Brazil	Chile	Lebanon	Namibia	Republic of Korea	Singapore	South Africa (from Chapter 5)
Reference documents	Government of the Republic of Brazil 2014, 2017, 2019	Government of Chile 2014, 2017, 2018	Government of Lebanon 2015, 2017, 2019	Government of Namibia 2014, 2016, 2019	Government of the Republic of Korea 2014, 2017, 2019	Government of Singapore, 2014, 2016, 2018	Refer to Chapter 5
Headline mitigation target in NDC	Brazil intends to reduce GHG emissions by 37% by 2025 relative to 2005 levels, with a subsequent indicative contribution to reduce its GHG emissions by 43% by 2030 relative to 2005 levels. In its NDC, Brazil communicated the absolute emissions levels that these targets imply—1,300 $MtCO_2e$ in 2025 and 1,200 $MtCO_2e$ in 2030.	Chile plans to reduce its CO_2 emissions intensity (per unit of GDP) by 30% by 2030, relative to 2007 levels.	Lebanon intends to reduce GHG emissions by 15% by 2030, relative to BAU levels.	Namibia plans to reduce GHG emissions by 89% by 2030, relative to 2030 levels. Namibia includes BAU levels in its NDCs, implying a 2030 target level of 2.5 $MtCO_2e$.	The Republic of Korea plans to reduce GHG emissions by 37% by 2030, relative to BAU. The 2030 Roadmap (the plan for achieving the 2030 target, published in 2016), clarified a 2030 target level of 536 $MtCO_2e$.	Singapore plans to reduce emissions intensity by 36% by 2030 relative to 2005 levels.	South Africa sets a goal for GHG emissions to be in a range of 398-614 MtCO2e between 2025 and 2030.
Criterion 1: The indicators are simple and easy to understand, relevant to the desired outcome, and precise and measurable	◒ Reporting on a range of indicators in BURs. Indicators are clear, precise, and relevent, but sometimes reduncany in the indicators. For example, for a mitigation action related to improving manure management,	○ Chile has not developed progress indictors for mitigation actions. Reporting on progess is done in an ad-hoc manner, qualitatively, and with varying levels of detail. Progress is generally reported as	○ Lebanon has not yet developed indictors to track progress toward mitigation goals. The country is currently conducting a mapping of all mitigation actions to identify needs and gaps. The intent is to then	— No reporting of indicators in BURs.	— No reporting of indicators in BURs.	— No reporting of indicators in BURs.	◉ South Africa's tracking indicators are simple and easy to understand, are relevant for tracking mitigation action, and are quantifiable.

	Brazil	Chile	Lebanon	Namibia	Republic of Korea	Singapore	South Africa (from Chapter 5)
	indicators include both volume of methane used for electricity and volume of electric power generated.	implementation status, rather than outcome achieved.	build a framework for tracking progress toward goals, which will include relatively high-level desired outcomes, delivered through a number of lower level outputs, which are tracked using Key Performance Indicators. The envisaged framework is results-oriented.				
Criterion 2: Information collection is as simple as possible, but no simpler	▬ BURs do not report on the specific information collected, in addition to what could be inferred as needed to report on the abovementioned indicators (see C1).	○ Chile states a lack of a clear mandate on the type of information to be collected on a permanent basis to assess progress toward mitigation policies and actions.	○ There is no information flow between entitites responsible for a large share of emission reductions (the private sector and municipalities) and the government.	▬ BURs do not report on the specific information collected.	▬ BURs do not report on the specific information collected.	▬ BURs do not report on the specific information collected.	◒ DEFF appears to only collect information that is strictly necessary to undertake robust M&E work. DEFF does, however, encounter problems in collecting data.
Criterion 3: There is legislative support for collecting data and protecting confidential information	○ No legal mandate to collect mitigation-related data or protect confidential information.	○ No legal mandate to collect mitigation-related data or protect confidential information.	○ No legal mandate to collect mitigation-related data or protect confidential information.	○ No current legal mandate, but Namibia has indicated its intent to pusue new legislation/ regulations in order to collect	● The "Framework Act on Low Carbon, Green Growth," sets out legal obligations for reporting. Entities responsible for consuming large	● There is a legal mandate for the government to collect emissions-related data from companies and building owners.	● South Africa has established legal regulations to collect emissions data from companies. The regulations also contain provisions

	Brazil	Chile	Lebanon	Namibia	Republic of Korea	Singapore	South Africa (from Chapter 5)
				data from the private sector.	amounts of energy or emitting significant quantities of GHGs are required to report to government their progress in reducing emissions. The Energy Use Rationalization Act also provides legal grounds for information disclosure.		for the protection of information.
Criterion 4: The government can evaluate progress toward the NDC mitigation target by using outputs from the M&E work	◉ There are progress indicators for all significant mitigation actions. Progress is reported in BURs, submitted every 2-3 years.	○ See Criteria 1 and 2.	○ Lebanon states that it currently has no methodology for monitoring the progress of mitigation actions.	○ Namibia states that it hasn't yet been able to quantify the ex-post impact associated with the implementation of key mitigation actions due to lack of available information.	◉ There is intent to set intermediate goals every three years to evaluate progress toward the NDC and allow for course corrections along the way.	◉ There are established non-GHG progress indicators for all significant mitigation actions. Progress is reported in BURs, submitted every 2 years.	◉ Since progress toward the NDC mitigation target is assessed using only the GHG inventory, which is already produced by the M&E system, this criterion is met.
Criterion 5: Transparency is enhanced when using outputs from the M&E work	◉ Relatively advanced when compared with non-Annex I peers. Three BURs between 2014 and 2019; three national communications	◉ Relatively advanced when compared with non-Annex I peers. Three BURs between 2014 and 2019; three NCs between 2000 and 2016.	◉ Relatively advanced when compared with non-Annex I peers. Three BURs between 2015 and 2019; three NCs between 1999 and 2016.	◉ Relatively advanced when compared with non-Annex I peers. Three BURs between 2014 and 2019; three NCs between 2002 and 2015.	◉ Relatively advanced when compared with non-Annex I peers. Three BURs between 2014 and 2019; four NCs between 1998 and 2019.	◉ Relatively advanced when compared with non-Annex I peers. Three BURs between 2014 and 2018; four NCs between 2000 and 2018.	◉ Relatively advanced when compared with non-Annex I peers. Three BURs between 2014 and 2019; three NCs between 2003 and 2018. Also

	Brazil	Chile	Lebanon	Namibia	Republic of Korea	Singapore	South Africa (from Chapter 5)
	(NC) between 2004 and 2016.						prepared annual climate change reports.
Criterion 6: All actors can understand the links between climate mitigation efforts and national social and economic consequences when reviewing the outputs from the M&E work	◉ The BURs provide qualitative descriptions of specific socio-economic benefits of specific mitigation actions. For example, reducing GHG emissions in agriculture is linked with sustainable farming practices, which improves food productivity and the profitablity of farms.	○ See C1 and C2. Chile has been working on an MRV system since 2011. While results of mitigation actions are not yet quantified, the country states that it is developing a framework that will allow for estimation of GHG emissions and co-impacts. Chile also states that "the importance of mitigation within the context of climate change lies not only in the net reduction of GHG emissions to the atmosphere, but also in the benefits that mitigation actions involve…highlighting such benefits is key for the design of new policies to enable	○ See C1, C2, and C4. Lebanon intends to develop a tracking framework, the plans do not include the tracking of socio-economic impacts.	◒ The BURs provide qualitative descriptions of specific socio-economic benefits of specific mitigation actions. The BUR also explains links between the MRV system and the country's M&E system for tracking progress toward national development priorities. This helps to ensure coordination and assist with decisions associated with sustainable development. However, Namibia has stated its intent to actively decouple its climate change MRV system from the M&E system associated with tracking progress toward national development priorities. The	○ No quantitative/ qualitative descriptions of socio-economic impacts of climate change, nor the socio-economic benefits/ costs of mitigation actions. Reference to the "creation of jobs and new markets" in the 2030 Roadmap is opaque.	○ No quantitative/ qualitative descriptions of socio-economic impacts of climate change, nor the socio-economic benefits/ costs of mitigation actions.	◒ South Africa is clearly demonstrating an intent to communicate information on the linkages between climate mitigation efforts and national social and economic consequences—but this is not yet occurring in all cases.

	Brazil	Chile	Lebanon	Namibia	Republic of Korea	Singapore	South Africa (from Chapter 5)
		developing countries to increase their level of ambition with a vision of meeting the temperature objectives agreed under the Paris Agreement."		rationale is that the "UNFCCC context is more demanding in terms of outputs and indicators."			
Criterion 7: On track to achieve the NDC or, as a proxy, on track to achieve the Copenhagen pledge	◉ 2020 target levels are between 1,977-2,068 $MtCO_2e$. Appears to be on track to meet this goal. Emissions remained relatively flat between 2009 and 2015. Net GHG emissions in 2015 were 1,368.1 $MtCO_2e$ in 2015, more than 600 $MtCO_2e$ than target levels for 2020.	◉ The goal is a 20% deviation from BAU by 2020. BUR3 presents quantitative figures for BAU, showing that Chile appears to be on track to meet the 2020 goal.	— Lebanon did not communicate a Copenhagen pledge.	— Namibia did not communicate a Copenhagen pledge.	○ 2020 target levels are 548 $MtCO_2e$. Does not appear to be on track to meet this goal. The Republic of Korea's emissions steadily increased from 1990-2013 and remained relatively flat between 2013-2016. Net GHG emissions including sinks were 649.6 $MtCO_2e$ in 2016, more than 100 $MtCO_2e$ higher than target levels for 2020.	— No quantitative target level provided for 2020. The goal is a 16% deviation from BAU (BAU not defined). While the third BUR states that Singapore is on track to achieve its Copenhagen pledge, there is no supplementary information to confirm this assertion.	◉ South Africa appears to be on track to reach the Copenhagen pledge, based on emissions projections and assumptions associated with the pledge.
Criterion 8: NDC tracking is iterative (performance oriented) and supports continual learning and improvement	○ Despite the detailed reporting of the country's MRV system and implementation of mitigation actions,	○ See Criteria 1 and 2.	○ See Criteria 1, 2, and 4.	○ Evidence suggests this criteria is not met. Namibia states that it still "needs to generate	◉ The Republic of Korea states that the intermediate goals will (a) enhance the predictability of	◉ BUR3 states that Singapore "pursues continual learning to fine-tune our technical expertise on a	◒ While it is clear that South Africa intends to use the outputs form M&E work to inform policy direction,

	Brazil	Chile	Lebanon	Namibia	Republic of Korea	Singapore	South Africa (from Chapter 5)
	there is no evidence to suggest that the outputs of the M&E work have resulted in any changes to mitigation actions or changes in policy.			information to inform policies, invest in mitigation, amd motivate for access to climate finance."	achieving the 2030 target, (b) strengthen implementation of existing measures, and (c) enhance performance management. Additionally, the 2030 Roadmap (the plan for achieving the 2030 target) incorporates continual feedback and evaluation, which will result in the identification of areas for improvement. This is to be done in consultation with the Office of Government Policy Coordination.	wide range of issues from reporting processes to enhancing our climate change activities." The MRV system is designed with a goal of improvement over time and identifying opportunities to enhance climate actions.	there is no published evidence to suggest that this is happening.

8. Conclusion

The Paris Agreement requires that all Parties track and report progress toward the implementation and achievement of their NDCs (UNFCCC 2015, Article 13.7(b)). Since this is an international obligation, this thesis explored how NDC tracking can be useful from a domestic standpoint too. The central research question of the thesis was: "how can tracking progress toward the mitigation targets in NDCs be most effective?"

Academic and grey literature were reviewed to understand what is known about effective mitigation goal target tracking and gaps in current knowledge, especially relating to NDCs, which are a fairly new concept since the Paris Agreement only dates to 2015. Set against this survey of the literature, a methodology was developed to investigate the research question. The methodology encompassed four main components: content analysis of key documents, in-depth interviews to gather primary data, a case study on South Africa, and comparative analysis.

The case study firstly developed a framework for effective NDC tracking—in essence, a structure for ensuring that NDC tracking is performance-oriented and supports the achievement of set objectives. The framework is based on program theory—specifically, results-based management combined with a logical framework approach, which is a theoretical foundation commonly used by national governments for climate change M&E.

The development of the framework found that NDC tracking is effective when it begins with planning (i.e. identifying the vision and objectives of NDC tracking), before establishing a means for achieving that vision through a logical framework approach (where inputs feed into processes which in turn deliver outputs to support outcomes)—all set within the context of an enabling environment. There is regular feedback to support continual learning and improvement. NDC tracking is also effective when it furthers national priorities, improves policy performance, enhances understanding and transparency, promotes trust and accountability, and links climate action with socio-economic outcomes.

The framework was then applied to NDC tracking in South Africa. The evaluation showed that South Africa is already fully meeting criteria in several areas of NDC tracking: DEFF is collecting information in a simple manner that already meets the minimum international requirements for NDC tracking; there is legislative support for the collection and protection of information; the mitigation indicators are easy to understand and relevant to NDC tracking; and evidence suggests that the outputs produced from South Africa's M&E work do enhance transparency and will allow the government to evaluate progress toward the NDC target.

The evaluation also revealed areas for improving NDC tracking in South Africa, and the thesis offered recommendations based on findings from the literature and the interviews. These recommendations include enhancing the capacity and skills of the M&E unit, improving information collection and reporting, demonstrating links between climate mitigation and positive socio-economic outcomes, and making NDC tracking more performance oriented.

The framework was applied six other developing countries to clarify the scope of its applicability and deepen the analysis of this research. This application revealed that the framework is broadly applicable, and the criteria are universal. The results of the application showed that there are currently several deficiencies in mitigation goal tracking in the six countries assessed. This finding implies that these countries may be challenged to effectively track NDCs in future without additional resources and capacity, despite already being fairly advanced on international reporting.

The framework developed in this thesis complements the international NDC tracking rules agreed to in 2018, by providing a possible approach to design effective NDC tracking processes, or evaluate the extent to which countries are prepared for NDC tracking and identify areas for enhancement. While the framework developed in this thesis is constrained to mitigation tracking, it could be feasibly extended in future to encompass NDC adaptation tracking, or an even broader application for tracking all domestic climate change action.

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Appendix 1: Details of Interviews

Interview 1: Interview by phone between author and anonymous informant from the *government* stakeholder group, 15 June 2019.

Interview 2: Interview by phone between author and anonymous informant from the *government* stakeholder group, 13 May 2019.

Interview 3: Interview by phone between author and anonymous informant from the *government* stakeholder group, 21 May 2019.

Interview 4: Interview by phone between author and anonymous informant from the *government* stakeholder group, 21 June 2019.

Interview 5: Interview by phone between author and anonymous informant from the *business* stakeholder group, 23 May 2019.

Interview 6: Interview by phone between author and anonymous informant from the *business* stakeholder group,13 May 2019.

Interview 7: Interview by phone between author and anonymous informant from the *business* stakeholder group, 28 June 2019.

Interview 8: Interview by phone between author and anonymous informant from the *business* stakeholder group, 20 May 2019.

Interview 9: Interview by phone between author and anonymous informant from the *academic* stakeholder group, 5 July 2019.

Interview 10: Interview by phone between author and anonymous informant from the *academic* stakeholder group, 31 May 2019.

Interview 11: Interview by phone between author and anonymous informant from the *business* stakeholder group, 31 May 2019.

Appendix 2: List of Questions for Interviews

South Africa's climate change M&E system – Context

1. What do you think was the prime driver for building a climate change M&E system in South Africa?
    a. The national climate change response white paper
    b. International reporting requirements
    c. Legislative requirements
    d. Citizen demand
    e. General desire to track progress [and update policy drivers as appropriate]
    f. Other
    g. Combination of any of the above

2. Who do you think are the champions for building and using the M&E system?
    a. Parliament/parliamentarians
    b. Government
    c. Business
    d. Bilateral/multilateral aid organizations/donors
    e. Academia
    f. Civil society
    g. Citizens
    h. Other
    i. Combination of any of the above

3. Who do you think will most benefit from the M&E system?
    a. Parliament/parliamentarians
    b. Government
    c. Business
    d. Bilateral/multilateral aid organizations/donors
    e. Academia
    f. Civil society
    g. Citizens
    h. Other
    i. Combination of any of the above

4. What do you think is the main goal of climate change M&E in South Africa?

5. Related to (4), do you think this goal has changed over time in relation to domestic policy developments or international regimes e.g. the adoption of the Paris Agreement and the NDC specifically? Why or why not?

6. How would you describe, in a word or a phrase, what you know of the current status of South Africa's M&E system?

South Africa's climate change M&E system - Capacity

7. What do you think are the skills required for officials in the Department of Environmental Affairs' Climate Change and Air Quality Branch for implementing and using South Africa's M&E system? Do you know of any gaps?

8. Are you aware of any technical assistance, capacity building, or training in climate change M&E now underway or that was done since the Paris Agreement was adopted?

9. Do you know of any institutes, research centres, private organizations, or universities in the country that have some capacity to provide technical assistance and training for government officials charged with implementing and using the M&E system?

10. Do you think the business sector needs additional capacity or training (or both) to meet the reporting requirements of the M&E system?

South Africa's climate change M&E system - Data collection

11. What are the main sources of data for South Africa's mitigation M&E system?

12. How is data collected?

13. How often is data collected?

14. Are you aware of any difficulties in collecting the data?

15. Who reports the data? How is information reported?

16. In your opinion, should reporting of data to government be mandatory? With penalties for non-compliance?

17. Do you know of any issues around the sensitivity of data? Or protection of confidential information? Are these issues adequately addressed now, in your view?

Tracking progress toward South Africa's NDC

The mitigation target in South Africa's NDC is: "South Africa's emissions by 2025 and 2030 will be in a range between 398 and 614 MtCO_2e." Mitigation policies and measures will assist South Africa in meeting this goal.

18. Regarding the NDC, what do you think should be tracked?
    a. The mitigation target
    b. The mitigation policies and measures (PAMs) that support the achievement of this target
    c. Both the mitigation target and PAMs

19. Can you tell me any indicators that you think could be used for tracking the:
    a. Mitigation target?
    b. Mitigation PAMs?

20. Do you know how these indicators have/could be established? For example:
    a. From NDC target itself
    b. From international reporting requirements e.g. the Katowice decision
    c. From the existing design of the M&E system i.e. what is already being tracked
    d. Other

21. Given that policy/regulatory/legislative actions take considerable time to reduce GHG emissions, do you think there is a role for qualitative indicators in tracking progress toward South Africa's NDC in the near term? If so, which indicators do you think would be particularly helpful?

22. What, in your opinion, is the most important thing that will make the tracking of progress toward the mitigation component of South Africa's NDC "effective"?

23. How would you define "effective" NDC tracking?